Ralco s.r.l.

ISO 9001:2000 ISO 13485:2003

R605DASM

SISTEMA DI COLLIMAZIONE RADIOLOGICA

RADIOLOGICAL COLLIMATING SYSTEM

CE 0051

MANUALE ISTRUZIONI / INSTRUCTIONS MANUAL
MTR605/025/DASM - R605/027/DASM - R605/170/DASM

Data Emissione: Date of Issue:	Livello di Revisione: Revision Level:	Emesso da: Issued by:
26.07.2006	06.11.2007	RALCO DIR RALCO AQ RALCO M.T.

R605DASM		
AUTOMATICO	**A**	AUTOMATIC
DIGITALE	**D**	DIGITAL
DOPPIO FILTRO	**DF**	DOUBLE FILTER
DOPPIA LAMELLA	**DL**	DOUBLE SHUTTER
LAMELLE FILTRANTI	**F**	FILTERING SHUTTERS
MOTORI PASSO-PASSO	**SM**	STEPPING MOTORS

LIVELLO REVISIONE/REVISION LEVEL:

This manual is a translation of the Italian text, which pervails in case of doubts.			
Rev. N	**Data/Date**	**N**	**Descrizone/Description**
A	06.09.2007	MRE/14/07	Board updating
			Aggiornamento scheda
B	06.11.2007	MRE/29/07	Board updating
			Aggiornamento scheda

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A - AVVISI / FRONT MATTER

LE RADIAZIONI EMESSE SONO DANNOSE PER L'OPERATORE E PER COLORO CHE SI TROVANO NELLA VICINANZE A MENO CHE NON SIANO OSSERVATE CORRETTAMENTE LE PROCEDURE PROTETTIVE. TUTTI COLORO CHE SONO AUTORIZZATI A INTERVENIRE SULL'APPARECCHIATURA RADIOLOGICA DEVONO CONOSCERE BENE LE PROCEDURE RIGUARDANTI LA PROTEZIONE CONTRO LE RADIAZIONI.	X-RAYS ARE DANGEROUS TO BOTH OPERATOR AND OTHERS IN THE VICINITY UNLESS ESTABLISHED SAFE EXPOSURE PROCEDURES ARE STRICTLY OBSERVED. THOSE AUTHORISED TO OPERATE OR SERVICE THE RADIOLOGICAL EQUIPMENT MUST BE THOROUGHLY FAMILIAR WITH THE PROCEDURES REGARDING RADIATION PROTECTION..
.	
IL DISPOSITIVO SODDISFA I REQUISITI ESSENZIALI DESCRITTI NELL'ALLEGATO 1 DELLA DIRETTIVA 93/42/CEE ED È CLASSIFICATO SECONDO L'ALLEGATO IX IN CLASSE IIB. IL COLLIMATORE È CONFORME ALLE NORME: IEC 601-1, IEC 601-1-2, IEC 601-1-3.	THE COLLIMATOR DESCRIBED HEREIN CONFORMS TO THE REQUISITES DESCRIBED IN ATTACHMENT 1AND IS CLASSIFIED CLASS IIB ACCORDING TO ATTACHMENT IV OF CEE 93/42/CEE DIRECTIVE. THE COLLIMATOR CONFORMS TO ISTANDARDS IEC 60601-1, IEC 60601-1-2, IEC 60601-1-3.
IL COLLIMATORE DEVE ESSERE INSTALLATO SU UN SISTEMA RADIOLOGICO GENERALE CONFORME ALLA DIRETTIVA CEE 93/42 LA CORRETTA INSTALLAZIONE, UTILIZZO E MANUTENZIONE DEL COLLIMATORE DOVREBBERO ESCLUDERE PROBLEMI DI FUNZIONAMENTO DEL COLLIMATORE STESSO E DEGLI APPARECCHI CIRCOSTANTI IN QUANTO LA RALCO HA SUPERATO LE PROVE EMC.	THE COLLIMATOR IS TO BE INSTALLED ON A GENERAL PURPOSE RADIOLOGY UNIT CONFORMING TO DIRECTIVE CEE 93/42. PROPER INSTALLATION, OPERATION AND MAINTENANCE OF THE COLLIMATOR SHOULD EXCLUDE OPERATION PROBLEMS OF THE COLLIMATOR AND OF THE SURROUNDING EQUIPMENT SINCE RALCO HAS SUCCESSFULLY PASSED EMC TESTING.
IL MANUALE ISTRUZIONI FORNISCE I RIFERIMENTI SU STANDARD E OPTIONALS. VERIFICARE LA VERSIONE ACQUISTATA SULL'ETICHETTA POSTA SULL'APPARECCHIO O NELLA DOCUMENTAZIONE AGGIUNTIVA..	THE INSTRUCTIONS MANUAL SUPPLIES INDICATIONS ON STANDARD OPTIONAL MATERIAL. SPECIFIC DATA REGARDING THE VERSION PURCHASED IS PROVIDED BY THE LABEL OR BY ANNEXED DOCUMENTATION.
CHIUNQUE SI TROVI AD UTILIZZARE QUESTO MANUALE DEVE LEGGERLO ATTENTAMENTE E PRESTARE ATTENZIONE AGLI AVVISI ED AI CONSIGLI IN ESSO CONTENUTI ANCHE NEL CASO IN CUI LA PERSONA INCARICATA DEL MONTAGGIO FOSSE ESPERTA DI COLLIMATORI RADIOLOGICI.	THE USER OF THIS MANUAL IS DIRECTED TO READ AND CAREFULLY REVIEW THE INSTRUCTIONS AND CAUTIONS CONTAINED HEREIN EVEN IF THE PERSON IS PERFECTLY CONVERSANT WITH THE INSTALLATION OF X-RAY COLLIMATOR.

VERIFICARE SUBITO DOPO L'INSTALLAZIONE LA SICUREZZA DEL SISTEMA GENERALE. QUANDO SI RENDE NECESSARIO SMONTARE LE COPERTURE FARE ATTENZIONE A RIMONTARLE CORRETTAMENTE – VEDI CAPITOLO - MANUTENZIONE.	TEST THE GENERAL SYSTEM SAFETY IMMEDIATELY AFTER ITS INSTALLATION. WHENEVER THE COVERS REQUIRE TO BE REMOVED CARE MUST BE TAKEN TO REMOUNT THEM CORRECTLY - SEE CHAPTER ON MAINTENANCE
L'INSTALLAZIONE E LE RIPARAZIONI DEL COLLIMATORE DEVONO ESSERE EFFETTUATE DA PERSONE AUTORIZZATE DALLA CASA COSTRUTTRICE DELL'APPARECCHIATURA RADIOGOLOGICA OPPURE DA PERSONA AUTORIZZATA DALLA RALCO STESSA. IL PERSONALE DEVE ESSERE A CONOSCENZA DELLE NORMATIVE SULLA SICUREZZA.	COLLIMATOR INSTALLATION AND SERVICING IS TO BE PERFORMED BY PERSONNEL AUTHORISED BY THE MANUFACTURE OF THE X-RAY EQUIPMENT OR BY RALCO SRL. PERSONNEL MUST BE FAMILIAR WITH THE SAFETY STANDARDS COVERING ELECTROMEDICAL EQUIPMENT
QUESTO DOCUMENTO E' STATO REDATTO E DISTRIBUITO DALLA RALCO SRL. PRODUTTRICE DEL COLLIMATORE IN OGGETTO. PER ULTERIORI INFORMAZIONI RIVOLGERSI A: RALCO SRL - VIA DEI TIGLI 13/G - 20046 BIASSONO (MI) - ITALIA FAX: ++39-039-2497.799 - EMAIL: RALCO@RALCO.IT	THIS DOCUMENT IS A TRANSLATION FROM THE ORIGINAL ITALIAN, PREPARED AND DISTRIBUTED BY RALCO SRL MANUFACTURER OF THE X-RAY COLLIMATOR DESCRIBED. ADDRESS ENQUIRIES TO: RALCO SRL -VIA DEI TIGLI 13/G -20046 BIASSONO (MI) - ITALIA FAX: ++39-039-2497.799 - EMAIL: RALCO@RALCO.IT

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B - DESCRIPTION

Compact radiological automatic collimating system for round and elliptic fields designed to operate with a mobile "C" arm Image Intensifier equipment.

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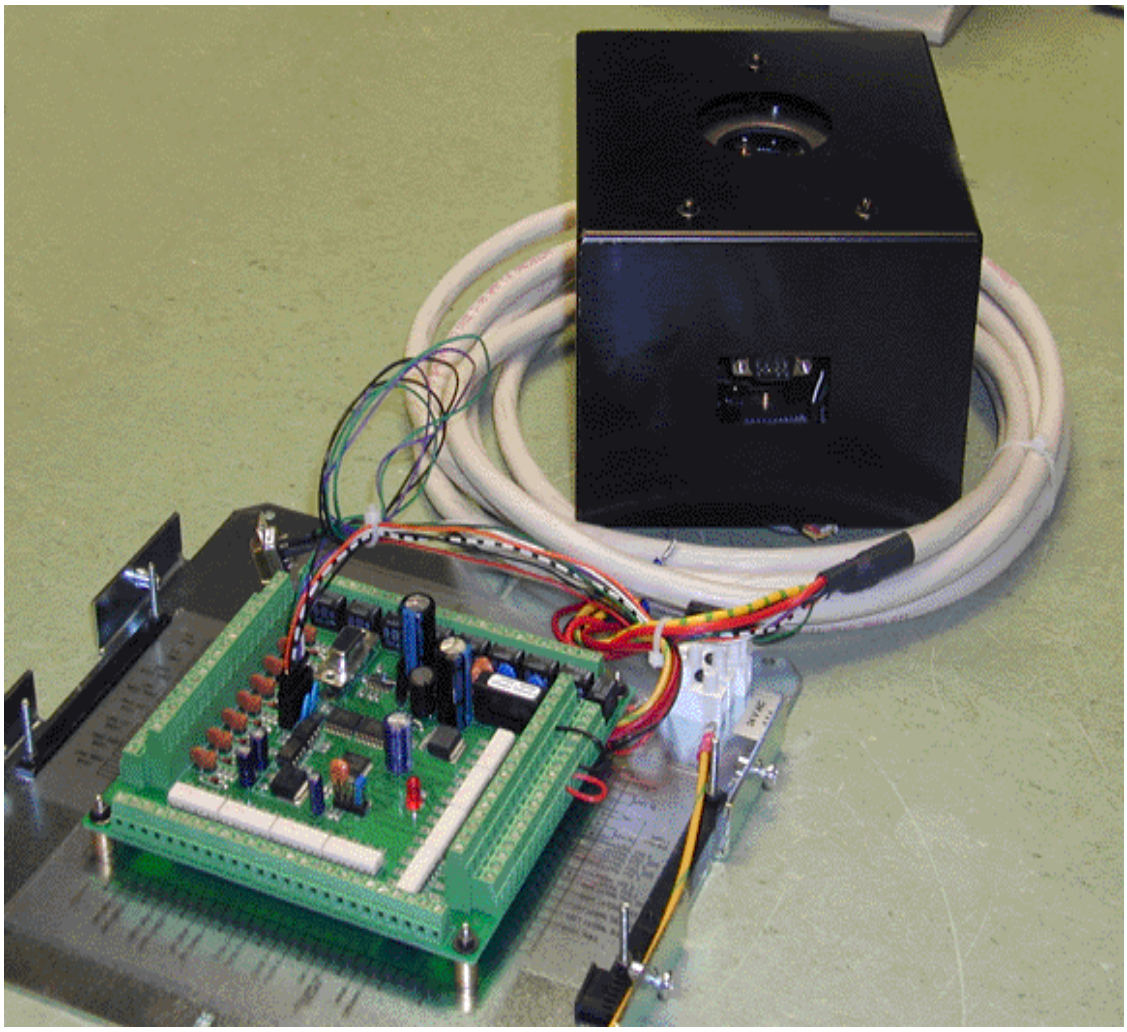


images\collimatori\605\605DASM

The round and elliptical fields are defined as follows: The round field by 8 lead shutters located near the exit window and a brass cone near the x-ray focus; the elliptical field by the round field and two pairs of lead rectangular shutters located near the collimator entrance window.

Round and elliptical field shutters are controlled by 5 stepping motors.

The collimator features a microprocessor cuit built into the collimator to control the 5 stepping-motors via external signal source with CanBus protocol.

The circuits return a CanBus protocol signal to indicate correct motor positioning.

The two pairs of lead rectangular shutters move jointly and both rotate ± 360°.

descrizione_605DASM.fm

During rotation the ellitpic field remains steady , with a tolerance of ± 10 mm, at a Focus Film Distance (FFD) of 100 cm.

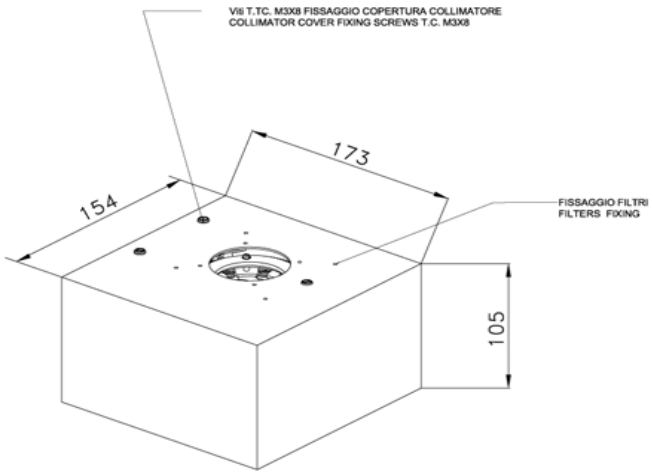
The field dimension at FFD 100cm (39.4”) with the collimator mounted at 80 mm (3.14") from the focus is 30 cm (12").

Characteristics:

- Radiation shielding 125 - 4 mA.
- Inherent filtration absent
- Round field variable from a minimum of 5cm to a maximum of 30 cm at 1m FFD. The radiological collimator, with round and elliptic x-ray fields, is designed and constructed for installation with **rotating or fixed anode x-ray tubes (EN 60601-1-3 par. 29.202.3).** The motorised movement of its shutters permits adjustment of the x-ray field to the area under investigation.

NOTE:
STANDARD VERSION FORESEES 30 CM (12") AT A FOCUS DISTANCE OF 100CM, FOR LOWER OPENING IT IS NECESSARY TO SUBSTITUTE THE SECONDARY COLLIMATOR.SPECIFY THE MAXIMUM REQUIRED OPENING ON THE ORDER.

R605DASM



Dim.in mm

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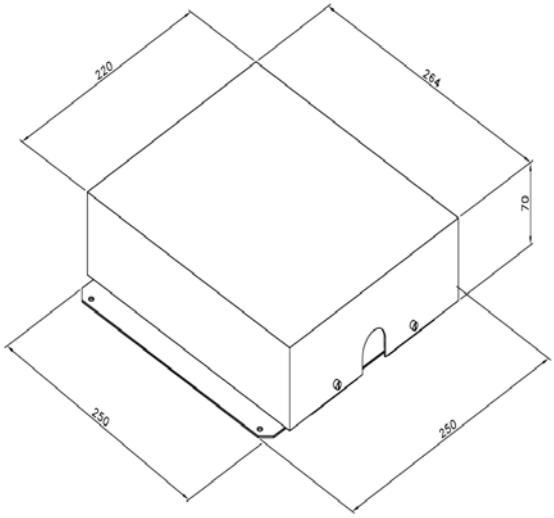

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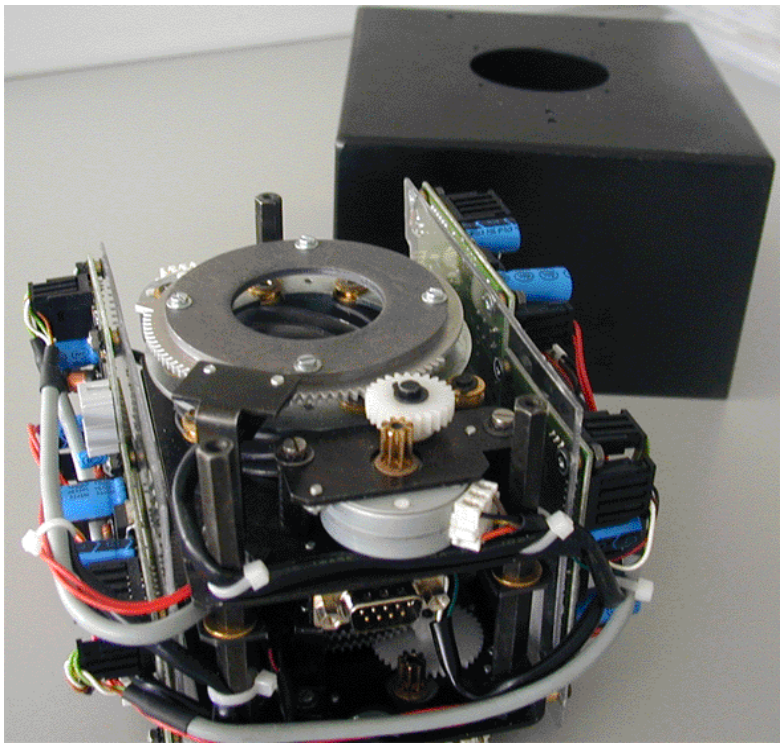
Versions:

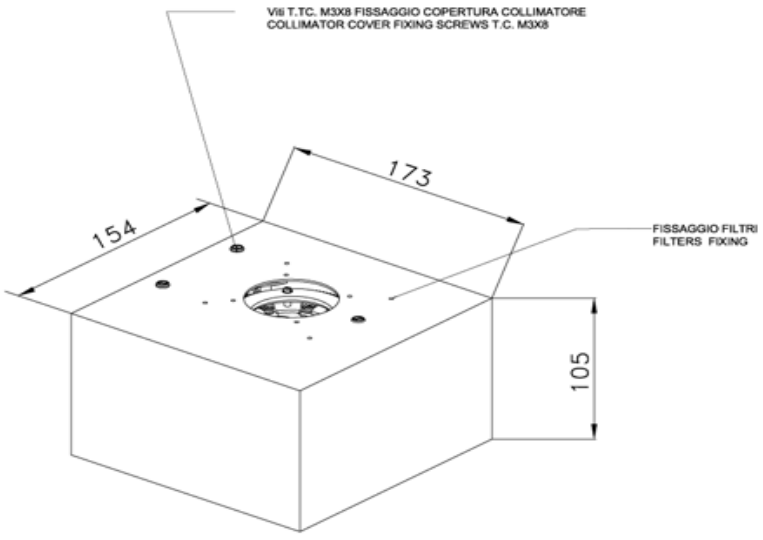
System can be provided in simplified and/or customised version, below described

R605/170/DASM

without external interface board located between the collimator and the external analogical components.



collimator\605\605_170_DASM



Dim.in mm

collimator\605\605_170_DASM

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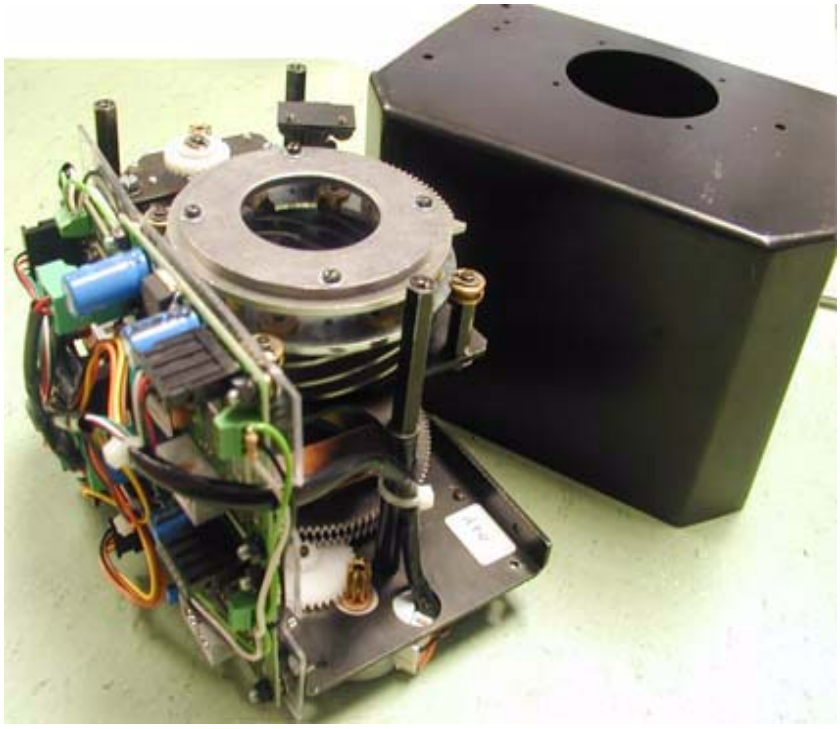
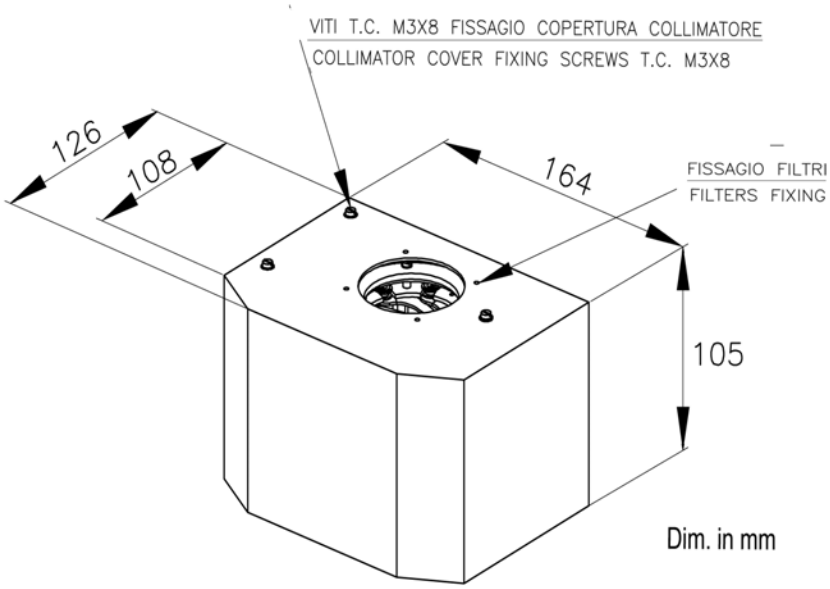
R605/025/DASM

without external interface board located between the collimator and the external analogical components and without second pair of rectangular shutters.





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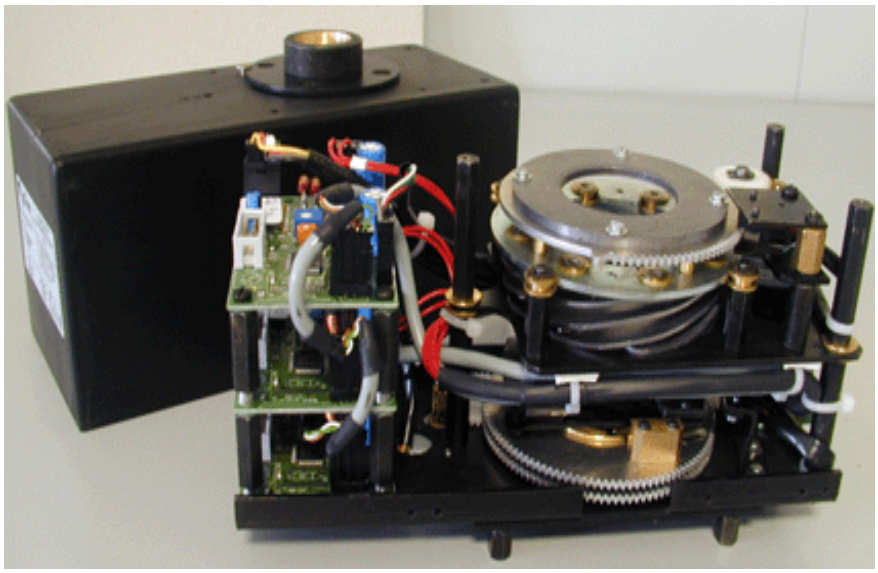
R605/027//DASM

without external interface board located between the collimator and the external analogical components and without second pair of rectangular shutters and with electronic circuit on the short side of the collimator .



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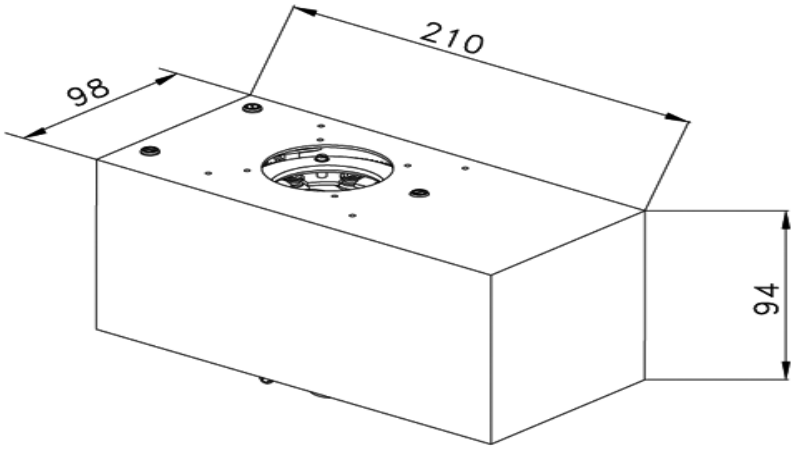

Dim.in mm

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C - SPECIFICHE / SPECIFICATIONS

Filtrazione inerente in equivalente di alluminio : **Fascio radiogeno = 75 kV** **EN 60601-1-3 par. 29.201.6 / 29.201.7**	**Min. Al 0mm**
Inherent filtration Al. equivalent : **X-ray beam = 75 kV** **EN 60601-1-3 par. 29.201.6 / 29.201.7**	
Limitazione Radiazione Extra-focale : **Distanza focale prevista, D.F.F. 1 m** **EN 60601-1-3 par.29.202.3**	**< 150 mm**
Limitation of Extra focal radiation: **Set focus distance, FFD (SID) 1 m** **EN 60601-1-3 par.29.202.3**	
Campo radiogeno quadro selezionabile: **1 m D.F.F - (± 1% FFD - SID)** **EN 60601-1-3 par. 29.202.4**	**n.a.**
Square X-ray field selection : **1 m FFD (SID) - (± 1% FFD - SID)** **EN 60601-1-3 par. 29.202.4**	**n.a.**
Campo radiogeno tondo selezionabile: **1 m D.F.F - (± 1% FFD - SID)** **EN 60601-1-3 par. 29.202.4**	**Min. <5cm diam.** **Max. 30 cm** **Lamelle rettangolari** **Rectangular shutters** **Min. 00 cm** **Max. 30 cm**
Round X-ray field selection : **1 m FFD (SID) - (± 1% FFD - SID)** **EN 60601-1-3 par. 29.202.4**	
Indicatore luminoso di campo - luminosità: **Luminosità a 1m dal fuoco, campo impostato 35 x 35 cm , Lampada alimentata a 24V, conduttori da 1.5mm** **EN 60601-1-3 par. 29.202.7**	**n.a.**
Light field indicator - luminosity: **luminosity at 1 m from the focus, set field size 35x35 cm, 24V lamp supply, 1.5mm leads** **EN 60601-1-3 par. 29.202.7**	
Indicatore luminoso di campo- contrasto: **Contrasto ai bordi impostando 35x 35 cm a 1m dal fuoco** **EN 60601-1-3 par. 29.202.7**	**n.a.**
Light field indicator - contrast: **edge contrast setting 35x35 cm at 1 m FFD (SID)** **EN 60601-1-3 par. 29.202.7**	
Precisione dell'indicatore luminoso di campo: **Corrispondenza con il campo radiogeno** **EN 60601-1-3 par. 29.202.9**	**n.a.**
Light field indicator precision: **Light field/x-ray field correspondence** **EN 60601-1-3 par. 29.202.9**	

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Precisione dell'indicazine di campo RX: **Impostazione indice su scala graduata** **EN 60601-1-3 par. 29.202.8**	**n.a.**
X-ray field indication precision: **Settings on an index scale** **EN 60601-1-3 par. 29.202.8**	
Distanza fuoco ricettore : (optional) **Precisione indicazione con metro retraibile** **EN 60601-1-3 par. 29.203.2**	**n.a.**
FDD (SID): (optional) **Precision of measurement with retractable tape** **EN 60601-1-3 par. 29.203.2**	
Radiazione di fuga: **Misurata a 100 cm dal fuoco con fascio radiogeno = 125 kVp / 4 mA - EN 60601-1-3 par. 29.204.3**	**< 40 mRh**
Leakage radiation : **Measured at 100 cm with x-ray beam = 150 kVp / 4 mA - EN 60601-1-3 par. 29.204.3**	
Alimentazione lampada:	**n.a.**
Power supply, lamp :	
Alimentazione motori:	**24V DC**
Power supply for motors:	
Fusibile:solo su scheda ASR003 - rapido. **L'alimentazione deve essere protetta di una fusibile non fornito.**	**3,15 Amp** **Ritardato Certificato** **Delayed Certified**
Fuse:on ASR003 only - rapid. Supply must be protected by a fuse which is not provided.	
Lampada / Lamp	**n.a.**
Filtrazione Aggiuntiva:	**20 mm AL. equivalent** **Lamelle in rame spessore/thick copper shutters: 1 mm** **Test: 75kVp-50 mA - 0,3 sec.**
Filtration, Additional	
Potenziometri: **Campo quadro** **Campo tondo**	 **n.a.** **1 turn/giro 1Kohm**
Potentiometers: **Square field** **Round field**	 **n.a.** **1 turn/giro 1Kohm**
Portata massima delle guide porta-accessori	**n.a.**
Maximum load for accessory guides	**n.a.**
Utilizzo del collimatore:	**Sistemi di fluoroscopia mobili**

Specif_605.fm

Collimator operation:	**Mobile fluoroscopy systems**
Dotazione Standard:	**- Manuale Istruzioni**
Items included with the collimator	**- Instructions Manual**
Peso/ Weight	**1,6 Kg**

NB: per campi inferiore, 9" e 7" è necessario sostituire il collimatore secondario. Pertanto all'ordine è indispensabile specificare il campo richiesto.
NB: the secondary collimator needs to be substitute if smaller fields, 9" and 7", are required. Please specify this requirement in your order.

Specif_605.fm

Validation of specification data:

- Validation of minimum filtration of the radiation unit (x-ray tube, collimator and possible filters) must be performed on a completely installed system by whoever is responsible for the installation.
- Validation of light field luminosity and contrast is performed in-factory. See Chapter **COMPLIANCE VERIFICATION.**
- Validation of system x-ray leakage is to be performed following the installation of the system components under the responsibility of the person performing the installation.
- The correct installation of the system, electronic calibration and wiring layout of the same are the responsibility of the engineer responsible for the installation of the system.
- Protection of the cable is to be provided by the installation engineer.

Ralco is prepared to provide any information required regarding the validation methods described above.

Classification

WARNING
GUIDES FOR ACCESSORIES PRIOR TO INSERTING ACCESORIES IN THE GUIDES CHECK ON THE PERFECT FIT OF THE SUPPORT WITH THE MOUNTING SLOT ON THE COLLIMATOR (TOLERANCE MAX. ± 0,5 MM). A FAULTY FIT COULD BE DANGEROUS AND IT COULD CAUSE THE FALL OF ACCESSORIES

EN 60601-1 par. 5

- Protection against electric hazards: "Class I" equipment
- Protection against direct and indirect contacts: Type B equipment with applied parts.
- Protection against water see page: "Common equipment"
- Safety of operation in the presence of inflammable anaesthetics with air or oxygen or nitrous oxide: Equipment not suited to application in the presence of inflammable anaesthetic mixtures containing air o oxygen of nitrous oxide.
- Operation conditions: Equipment for continuous operation at intermittent loads - See Chapter OPERATION INSTRUCTIONS.
- Should label data on the collimator not correspond to the specifications herein, inform Ralco of the non conformity.
- Verifications of the specifications are to be performed according to the indicated equipment standards.

Operation environment:

- Ambient temperature = from 10°C to 40°C
- Relative Humidity = from 30% to 75%
- Atm. Press. = from 700 to 1060 hPa.

verifica_spec.fm

per collimatori dotati di metro	for collimators with tape measure
AVVISO	**WARNING**
Uso del metro retraibile in collimatori dotati di questa funzione: **Il metro adottato è un metro standard montato su apparecchiatura radiologica. In questa applicazione il metro parte con la misurazione con un valore che corrisponde alla distanza fuoco/ bordo inferiore del collimatore; la massima estensione radiologica è di 2m max anche se, per ragioni meccaniche, il metro raggiunge 3 m max. A fine lettura meccanica massima viene riportata la scritta STOP.** *Estendere e/o forzare il nastro del metro oltre a questa misura causa i seguenti inconvenienti:* • rottura del nastro oppure • distorsione del nastro oppure • l'impossibilità di fare rientrare il nastro nell'alloggiamento perché è stata forzata la tenuta della molla sul nastro creando una distorsione. ***NOTA:* NON ESTENDERE IL NASTRO OLTRE Il NECESSARIO E IN OGNI CASO NON OLTRE LA SCRITTA STOP**	*Use of the retactable tape measure in collimators with this feature:* **The type of tape measure adopted is a standard tape mounted on a radiological unit. In this application the tape starts with values that correspond to the focus/collimator lower edge distance; maximum radiological measurement with the tape is 2 m max even though, for purely mechanical reasons, maximum tape extension is 3 m max. The indication of STOP is evident immediately after the maximum mechanical value.** *Forcing and/or extending the tape beyond this point with cause the following inconveniences:* • Breakage of the tape or, • Distortion of the tape or, • Impossibility of retracting the tape into its lodging because the grip of the spring has been forced and hook-up is consequently distorted. ***NOTE:* DO NOT EXTEND THE TAPE BEYOND THE INDICATION OF STOP**

EN 60601-1-3 para. 29.205 - Focus-Skin Distance

Paragraphs 29.205.1 - 29.205.3 of the above standard deal with preventing the use of inappropriate focus/skin distances in order that the dose equivalent to the patient be kept as low as reasonably achievable.

29.205.1 - Radiation Equipment for fluoroscopy

X-ray devices for fluoroscopy must feature characteristics that, during fluoroscopy, will prevent focus-skin distances less than:
- 20 cm if the x-ray device is specifically for fluoroscopy
- 30 cm for other applications

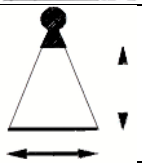
Conformity is measured and checked visually. The x-ray system must comply with the norm; this means that the operator is responsible for the verification. A focus/skin spacer device is an option made available by Ralco.

verifica_spec.fm

D - SIMBOLI/SYMBOLS

Simboli/ Symbols	Descrizione	Description	no.	Rif.CEI
	Corrente Alternata	Alternating Current	01-14	417-IEC 503
	Corrente Continua	Direct current	01-18	417-IEC 5031
	Corrente continue e Alternata	Both Direct and alternating current	01-19	417-IEC 5033
	Terra di protezione	Protective earth	01-20	417-IEC 5019
	Più; polarità positiva	Plus; positive polarity	01-27	417-IEC 5019
	Meno; polarità negativa	Minus; negative polarity	01-28	417-IEC 5006
	Entrata	Input	01-36	417-IEC 5006
	Uscita	Output	01-37	417-IEC 5034
	Controllo a distanza	Remote Control	01-38	
	Controllo manuale	Manual control	01-45	ISO 7000-096
	Controllo automatico	Automatic control (closed loop)	01-46	ISO 7000-0017
	Diaframma a iride aperto	Iris Diaphragm: open	01-69	ISO 7000-0017
	Diaframma a iride: chiuso	Iris Disaphragm: closed	01-70	417-IEC 5324
	Attenzionne, consultare i documenti di accompagnamento	Attention: Consult accompanying documents	03-02	IEC 601-1
	Filtro di radiazione oppure filtrazione	Radiation filter or filtration	04-51	417-IEC 5381
	Indicatore luminoso del campo di radiazione	Light indicator of radiation field	04-51	417-IEC 5381
	Dispositivo di limitazione fascio: aperto	Beam limiting device: open	04-55	417-IEC 5385
	Dispositivo di limitazione fascio: chiuso	Beam limiting device: closed	04-56	417-IEC 5386

simboli.fm

Simboli/ Symbols	Descrizione	Description	no.	Rif.CEI
	Dispositivo di limitazione fascio:chiuso con apertura separata della lamelle.	Beam limiting device: closed with separate opening of the shutters.	04-57	417-IEC 5387
	Dispositivo di limitazione fascio con chiusura separata della lamelle.	Beam limiting device with with separate closing of the shutters	04-58	417-IEC 5388
	Apparecchio tipo B	Type B device	02-02	601-I-IEC
	Attenzione radiazione Laser	Caution: Laser Radiation		60825-1
	Dispositivo sensibile all'energia elettrostatica.	Electrostatic sensitive device.		
	Dispositivo impostazione dimensione cassetta	Cassette size sensing device.		
	Dispositivo che richiede un corretto smaltimento.	Device requiring proper disposal.	attch.4	2002/ 95/CE

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E - COMPATIBILITY WITH X-RAY TUBES:

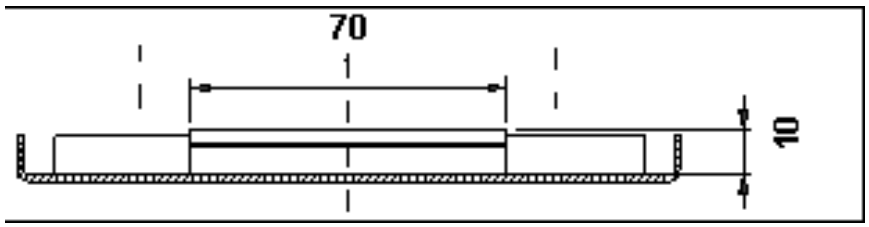
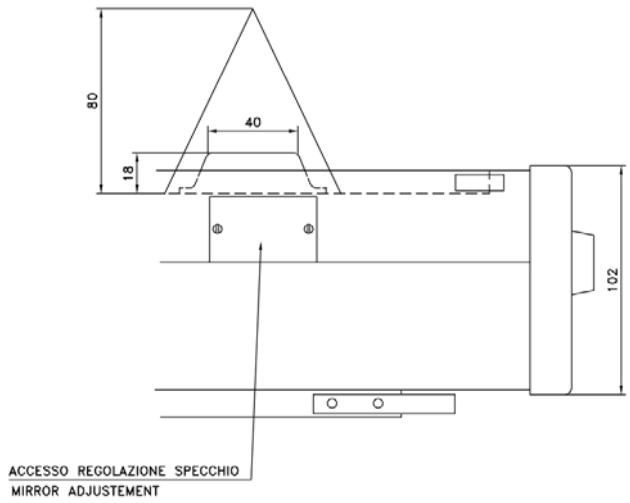
a) Compatibility between the collimator and x-ray tube is determined by the mechanical possibility of mounting them - See the following ***Table.***

b) Collimator R605DASM has no inherent filtration. Check that the tube housing literature indicates congruent minimum inherent filtration (1mm or 0mm) and, that maximum radiation leakage is 30 mr/hour measured at one meter from the source when operating at its leakage technique factors (125 at 4 mA).

c) Source values (tube housing-collimator) must not be less than 3mm Al for filtration and must never exceed 100 mR/hr for radiation leakage. (EN 60601-1-3 par. 29.201.7/29.201.6 e 21 CFR sub-chapter J, part 1020.30 (m) (1).

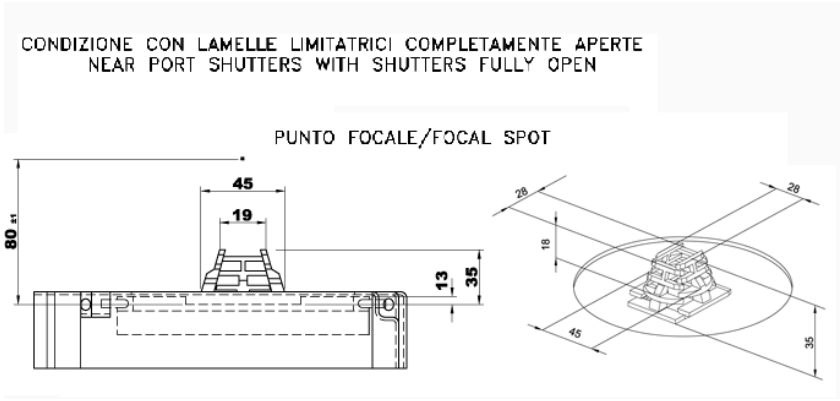
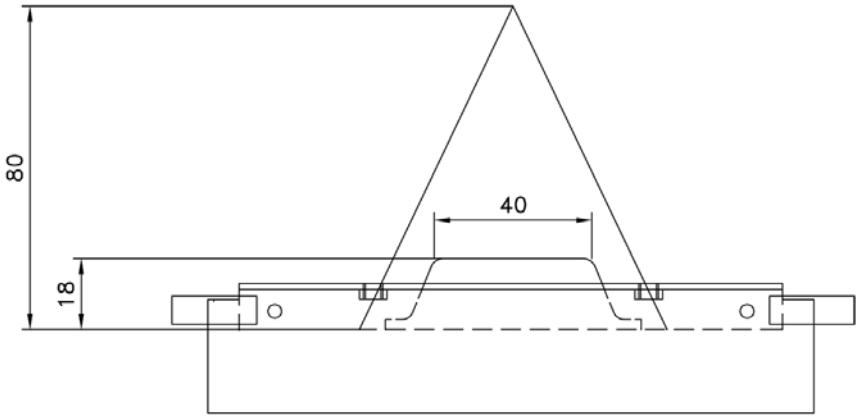
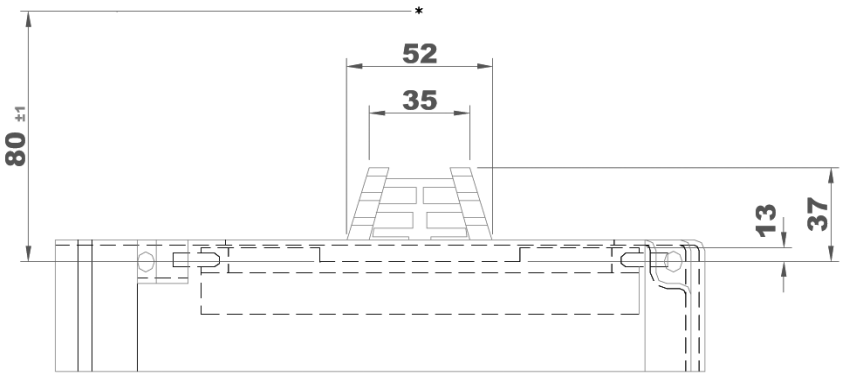
d) The distance between the tube x-ray focus and the flange mounting plane (collimator upper plate) must be 80 mm (3.14"), tollerance +/- 1mm (0.04”).

Table 1:

Collimators	
R72	 generali\r72_cufie.gif
R103 **R104** **R105**	 generali\cuffie_104.gif

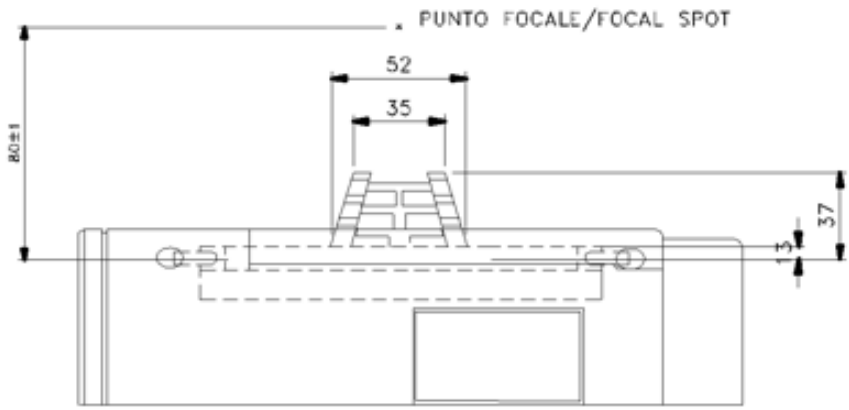
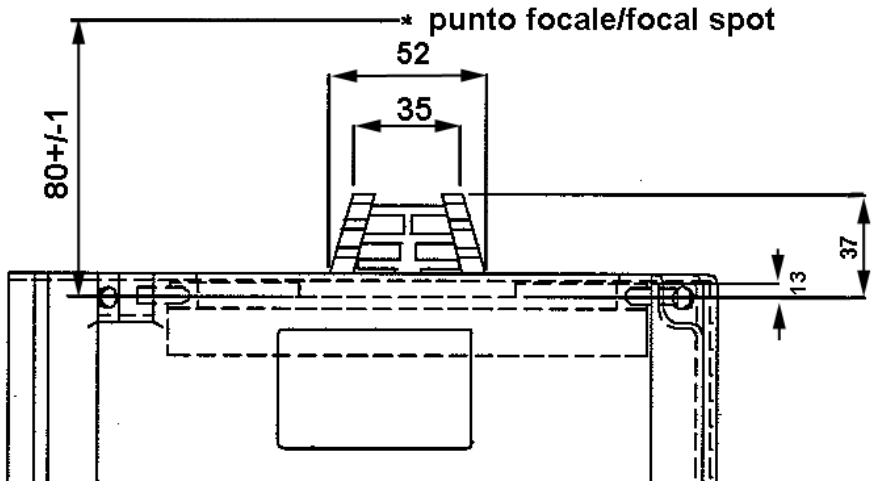
compatibilità_tubo.fm

Table 1:

Collimators	
R104/A	 collimatori\104A\cuffie_104_177_A.ξ
R107	 collimatori\107\comp_tubo
R108	 generale\108_cuffie

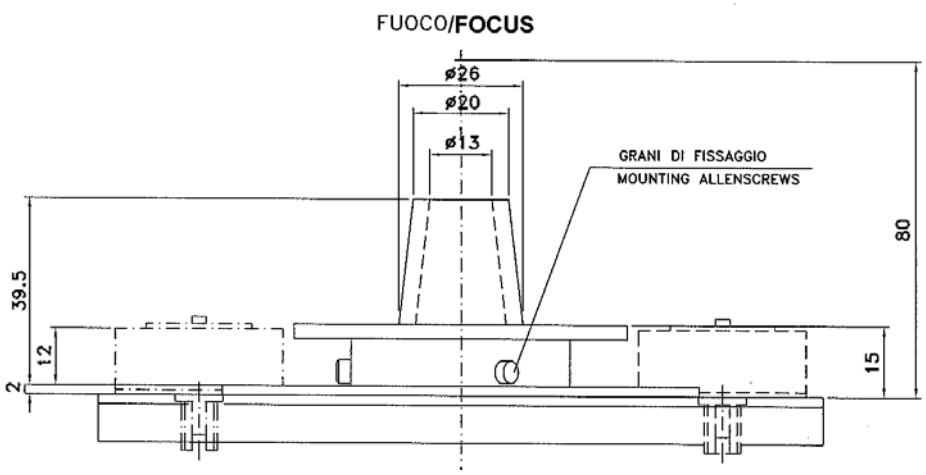
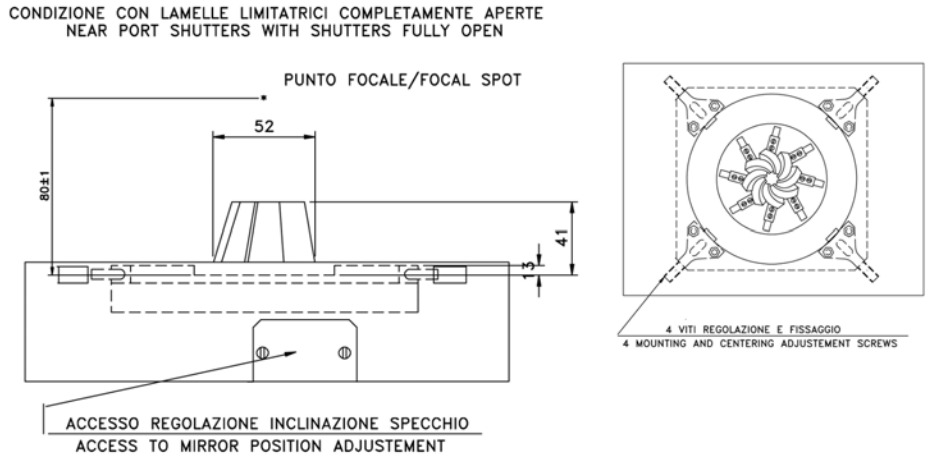
compatibilità_tubo.fm

Table 1:

Collimators	
R302/A **R302F/A** **R302L/A** **R302DACS/A** **R302MLP/A** **R302MLPI/A** **R503MLP/A**	 generali\06_compt_manuali
R221/A	 general\compt_manuali221

compatibilità_tubo.fm

Table 1:

Collimators	
R605DASM	 collimatori\605\compta_tubo_fig1.gif
R806D	 collimatori\806\tubo_R806D.gif

compatibilità_tubo.fm

F - MOUNTING THE COLLIMATOR TO THE X-RAY TUBE

WARNING:
CAREFULLY FOLLOW THE MOUNTING INSTRUCTIONS AND MAKE SURE THAT THE COLLIMATOR IS CORRECTLY ASSEMBLED. INCORRECT MOUNTING COULD BE DANGEROUS: IT COULD CAUSE THE COLLIMATOR TO FALL OR TO OPERATE INACCURATELY

a) Determine the distance from the focal spot to the tube port face from the X-ray tube housing literature

b) Subtract the resulting distance from 80 mm. (3.15") and determine how many 1.5 mm (0,06") spacers combined with the thickness of the mounting flange will make up the difference (15mm for the flange). Allowable tolerance is 1 mm. (0.04")

c) Carefully match the flange with the tube and make sure that the brass cone on the mounting flange is free from impediments on the side of the housing.

d) Select four bolts of suitable thread (M4) and of such a length that they protrude through the flange and spacers far enough to engage at least 5 threads into the tube port face. Securely bolt the flange to the tube port face..

IMPORTANT
TO SAFEGUARD THE OPERATOR AND PATIENT AGAINST THE HAZARD OF A FALLING COLLIMATOR, THE FOLLOWING INDICATIONS ARE TO BE RESPECTED.

e) Unscrew, but not remove, the three mounting Allen screws on the collimator metal ring. See **Figure 1** in this Chapter

f) Fit the metal ring on the collimator over the mounting flange and tighten the screws.

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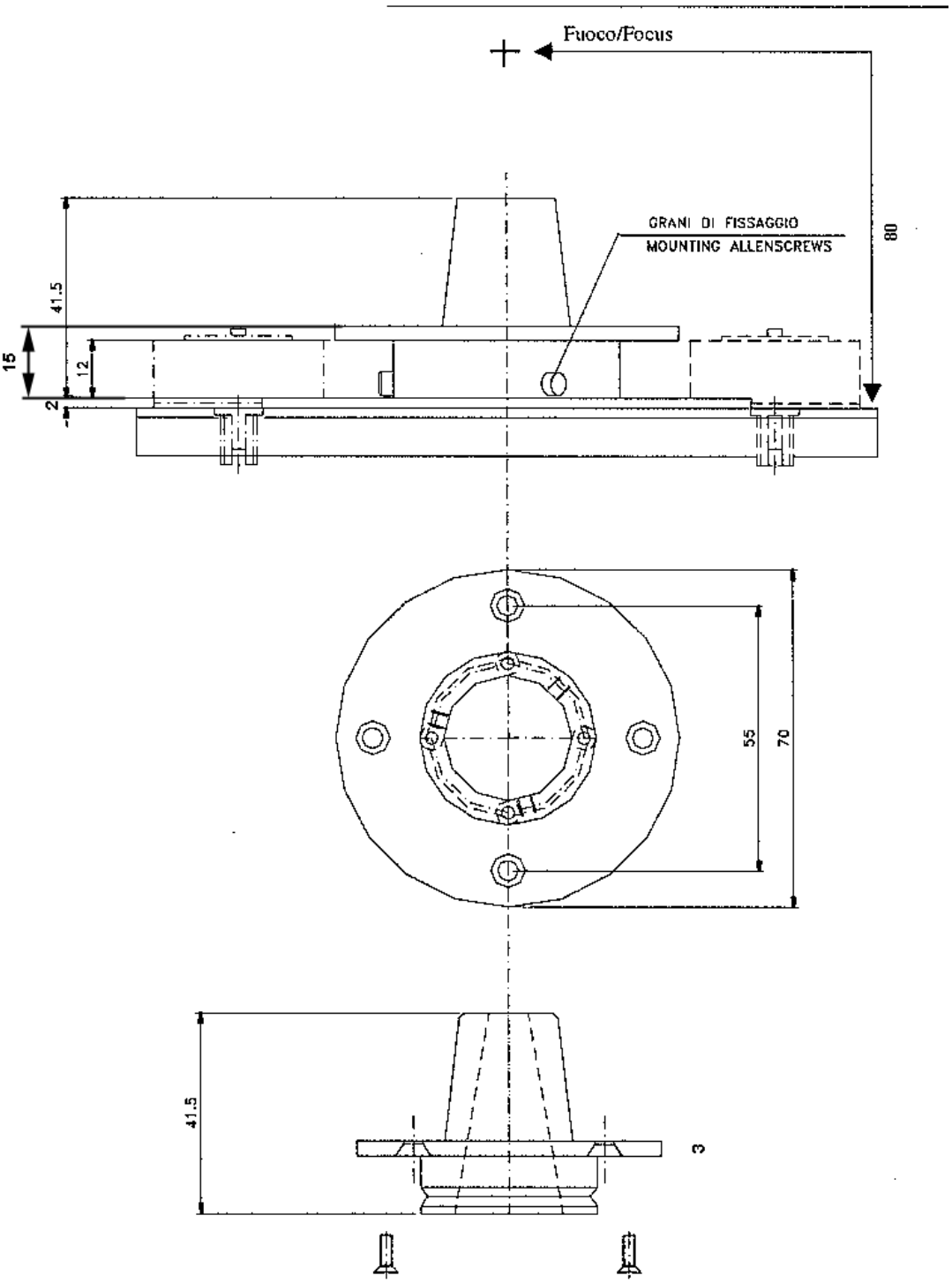
Figura 1



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montag_coll-tubo.fm

MECHANICAL INSTALLATION OF THE EXTERNAL INTERFACE UNIT:

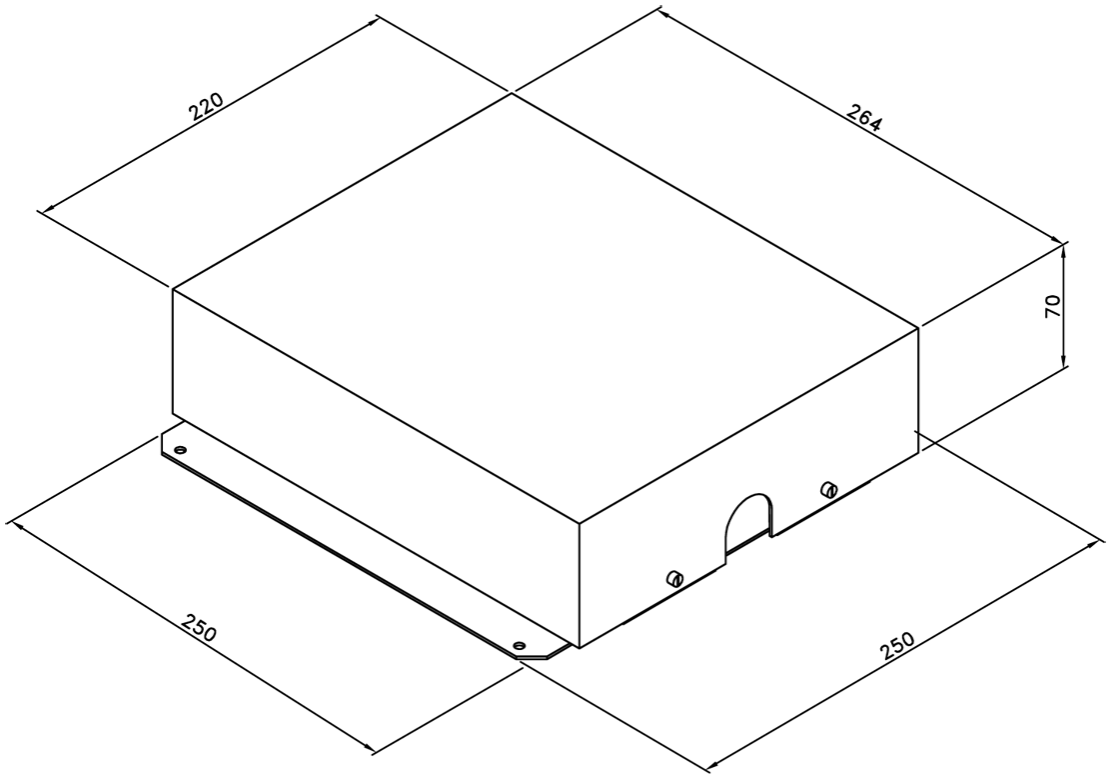
The external box is to be installed in such a way as to ensure connection of all the electric devices present in the radiological system.

We suggest that the box be installed at a safe distance from electromagnetic sources such as high voltage transformers.

Use the holes on the sides of the box to perform the installation.

Should it be necessary to install the back within a rack of the general system, remove the electronic board from the box prior to proceeding with the installation of the box itself.

Make sure that each portion of the rack that is to accommodate the box is adequately earthed.



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installazione_mecc_pt2.fm

G - COLLEGAMENTO ELETTRICO/ELECTRIC CONNECTION

ATTENZIONE L'ALIMENTAZIONE SUL COLLIMATORE NON È PROTETTO DA FUSIBILE. PRIMA DI COLLEGARE, CONTROLLARE CHE L'ALIMENTAZIONE SIA PROTETTA DA FUSIBILE ESTERNO. FUSIBILE: 3,15 AMP	WARNING COLLIMATOR SUPPLY IS NOT PROTECTED BY A FUSE. PRIOR TO CONNECTING THE UNIT CHECK THAT SUPPLY IS PROTECTED BY AN EXTERNAL FUSE. FUSE: 3,15 AMP

Collegamento/Connection R605 DASM:

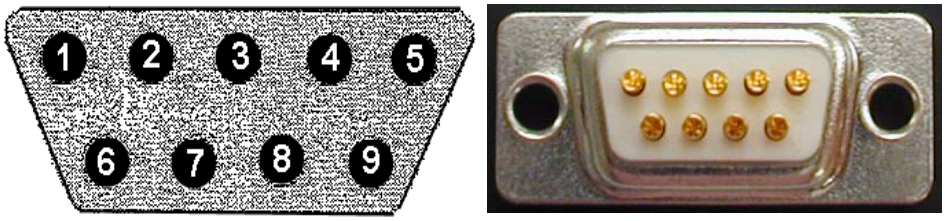

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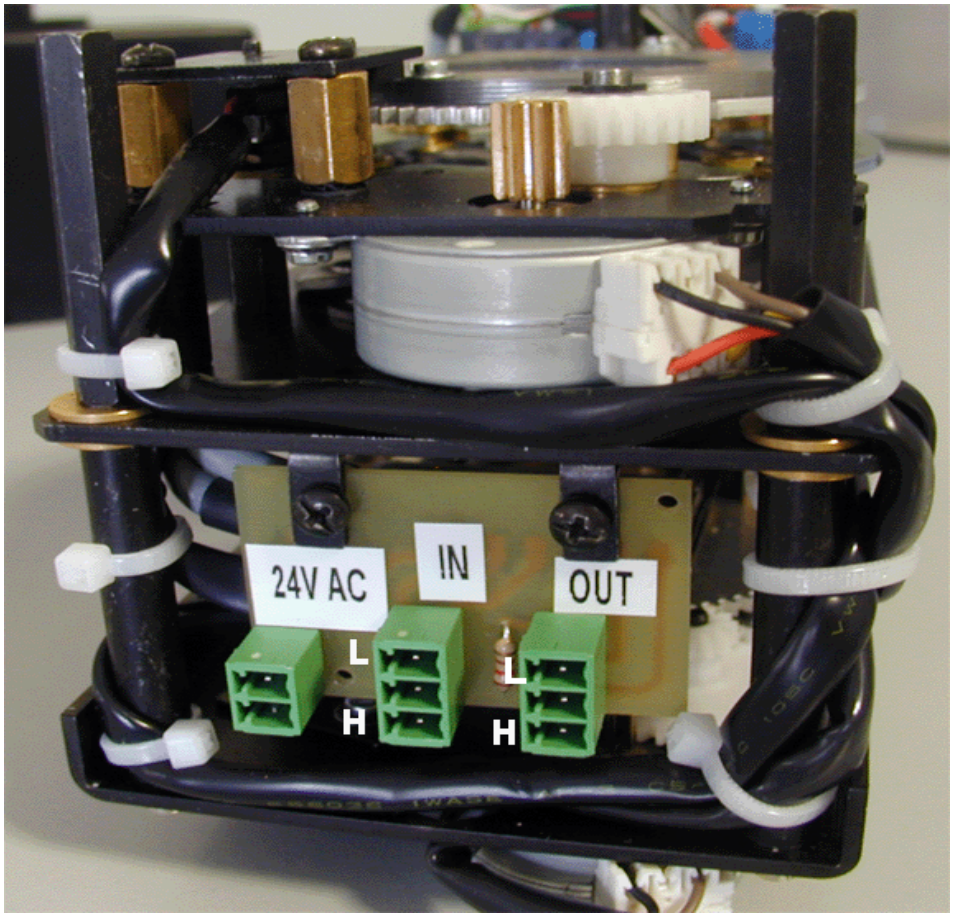
Table 1: 9 pin (male) D-Sub CAN Bus PinOut

Pin n.	Signal Names	Signal Description
1		
2	CAN_L	Dominant Low
3	CAN_GND	Ground
4		
5		
6	GND (24 AC)	Ground
7	CAN_H	Dominant High
8		
9	CAN_V+ (24 AC)	Power

coll_ell.fm

Table 2: R605/027/DASM

Pin n.	Signal Names	Signal Description
1	24 VAC	Supply
2	24 VAC	Supply
1	CAN_L	Dominant Low
2	CAN_GND	Ground
3	CAN_H	Dominant High



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coll_ell.fm

H - ELECTRICAL POWER CONNECTION OF THE EXTERNAL UNIT TO THE GENERAL SYSTEM

WARNING: THE SYSTEM MUST BE SUPPLIED BY 24VAC +/- 10%. ANY VOLTAGE IN EXCESS WILL DAMAGE STEPPER MOTOR CONTROL ELECTRONICS

:

WARNING

PRIOR TO CONNECTING THE COLLIMATOR CHECK THAT SUPPLY IS PROTECTED BY AN EXTERNAL FUSE 6,3A (SEE THE SPECIFICATIONS).

CABLES (24VAC) USED FOR COLLIMATOR CONNECTION MUST BE SUITABLE FOR PURPOSE AND COLLIMATOR CURRENT ABSORPTION.(MIN. SECTION 1.5MM2)

THE SYSTEM REQUIRES SCREENED CABLES WITH THE ADDITION OF FERRITE CORES TO AVOID INTERFERENCE OF ELECTROMAGNETIC DISTURBANCES WITH THE SERVER ELECTRONICS.

CABLES FROM THE SYSTEM TO THE EXTERNAL BOARD MUST BE SCREENED.

THE FERRITE CORES ARE TO BE MOUNTED ON THE CABLES INSIDE THE BOX AS SHOWN IN THE DRAWING BELOW. FERRITE CORES ARE USED TO ATTENUATE INDUCTION AND IRRADIATION OF ELECTROMAGNETIC INTERFERENCE.

WE SUGGEST A 279 FERRITE, ATTENUATION RANGE 100 MHZ TO 200 MHZ, SUITED TO YOUR CABLES; EG: MSFC-10 FERRITE BY RICHCO

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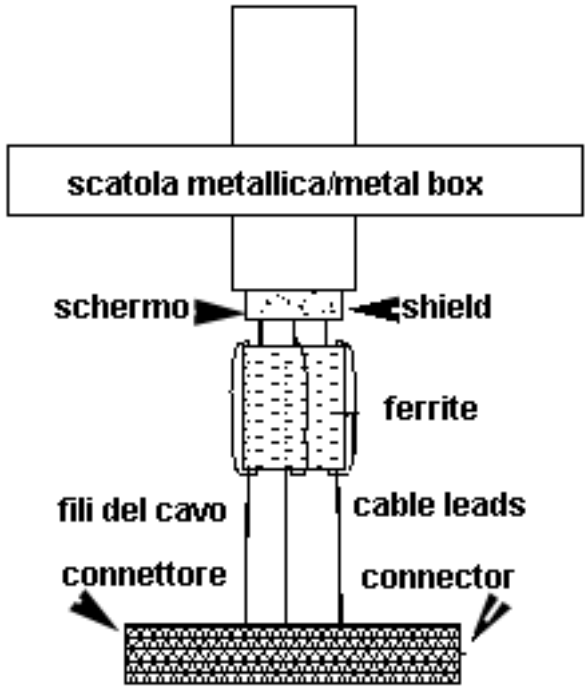

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Supply and signals to the collimator must be to 93/42CEE standards. Devices that supply to the collimator must therefore feature **double or reinforced insulation** as provided by the General Standard on Electro medical Equipment CEI62-5 +A2 (EN 60601-1)

The device is electrostatic sensitive consequently all the relating safety standards must be complied with.

All the system devices listed in the following tables (variable FFD table, variable FFD stand, fixed lateral FFD, vertical Bucky, lateral Bucky, etc.) are to be connected to the connectors of the external board.

WARNING: PREVENT METAL RESIDUE (SMALL CLIPPINGS OF CABLE WIRE) FROM DEPOSITING ON THE CIRCUIT TRACKS - THESE COULD DAMAGE THE BOARD OR CAUSE MALFUNCTIONS. PRIOR TO SUPPLYING THE SYSTEM, USE A VACUUM CLEANER TO CLEAN THE BOARD AND BOX. **DO NOT USE** COMPRESSED AIR.

Correct operation of the system is guaranteed if the return signals from the Bucky (if is foreseen) and FFD Potentiometres are not disturbed. Use tripolar screened cables with the addition of ferrite cores near the connections to the PC board (external unit)

The signal from the FFD variation control device must be analogic DC, 5VDC max

N.B. All transducers, Potter Bucky (if is foreseen) and FFD Potentiometres, fixed distance micro switches (if are foreseen), push buttons, etc. are analogic signals and are supplied by the board. The 5VDC power that supplies the Potentiometres is also used to supply the microprocessors that operate the collimator. The CAN signals are at 5V and would be damaged if they were to be connected to other circuits. It is therefore highly recommended to avoid reading electric signals shared with other electronic equipment; i.e. **do not use analogic signals generated by a unit external to the system** and make sure that the analogic signals are connected via screened cables.

Analogic signals from the main system need to be used (Volt direct current), these signals must never exceed 5V max. Any value in excess of this could damage the board.

Use appropriate cables to connect supply to the external unit (24V AC 5A - minimum supply transformer power 150 VA - external fuse 6A3) on contacts 83 and 84 (see the layout of board ASR003) and earth on contact 85. The metal box, besides being a mechanical protection, serves as electromagnetic shielding.

IMPORTANT:
THE 24VAC TO THE BOARD MUST BE SUPPLIED BY AN EXTERNAL TRANSFORMER WITH DOUBLE INSULATION ON THE SECONDARY WINDING. SECONDARY OUTPUTS MUST NOT BE EARTHED.

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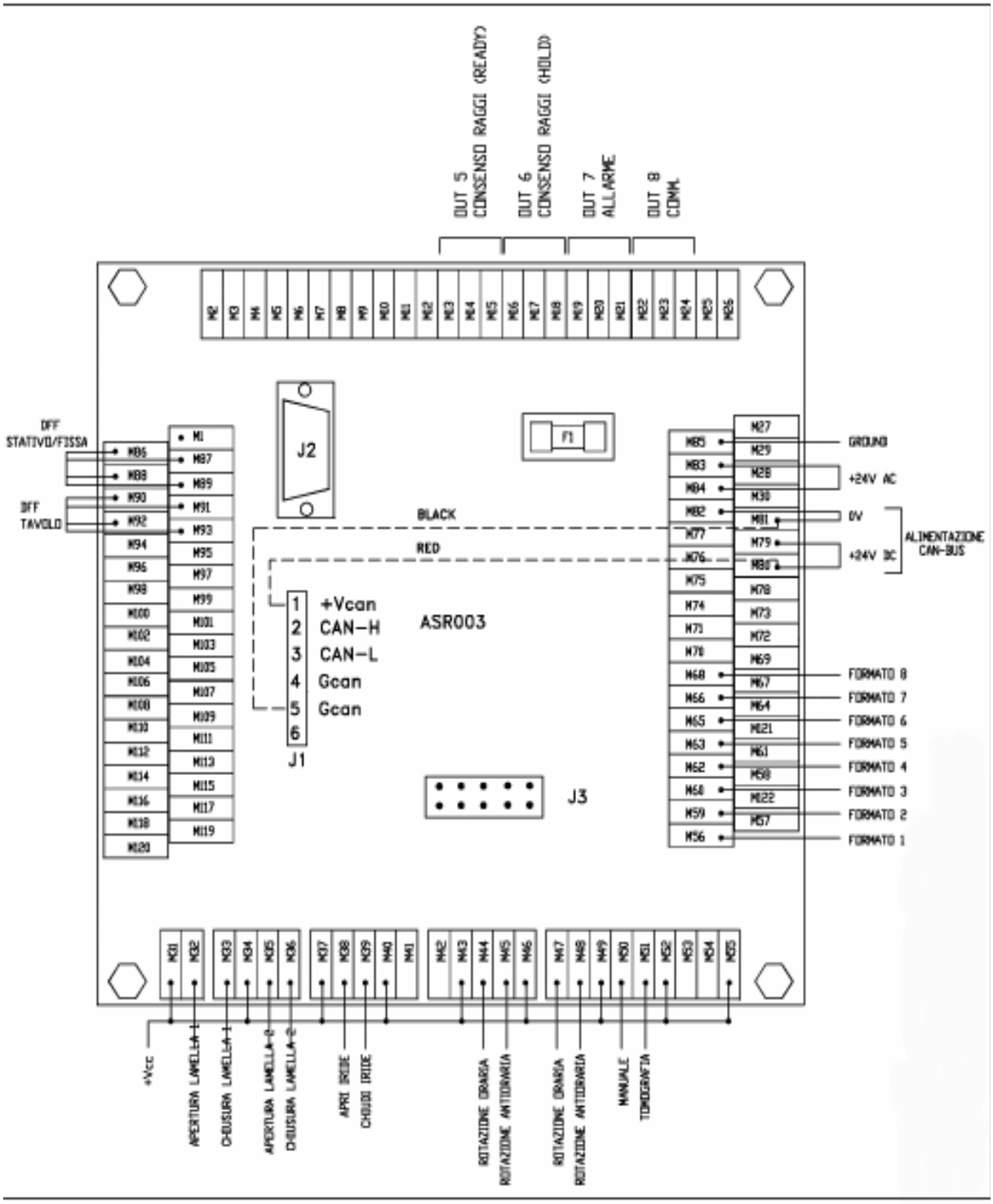
The earth connection of the collimator circuit is used to disperse noise or extra voltage coming from the collimator supply system.

The device that disperses noise is reversible, consequently noise instead of being eliminated is fed into the system power supply circuit. It is therefore essential that the earth outlet to which the system is connect be effectively the unipotential protection point of the system or the room.

NB: LEFT AND RIGHT SIDES HAVE BEEN DETERMINED BY LOOKING AT THE COLLIMATOR FRONT PANEL.

Collegamento elettrico - ASR003



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ASR003 connessioni/ connections

Descrizione	contact	Description
Alimentazioni - *morsettiera*		***Supplies -*** *terminal board*
Alimentazione 24Vac	M84/ M83	24VAC Supply
Collegamento Terra	M85	Earth
Uscita 24VAC verso collimatore	M84/ M83	24VAC output to collimator
CAN-BUS - morsettiera estraibile AMP	J1	**CAN-BUS -** removable terminal board AMP
+V CAN ingresso alimentazione sezione di input	PIN1	+V Can supply input section
Linea CAN-H	PIN2	CAN-H line
Linea CAN-L	PIN3	CAN-L line
GCAN	PIN4	GCAN
GCAN	PIN5	GCAN
Porte seriali RS232 - *D-sub 9 poli Maschio*		***RS232 serial gate -*** *D-sub 9 pole male*
Porta seriale usare cavo AT-link verso PC.	J2	Serial gate, use AT-Link cable to PC.
Porta seriale RS232 programmazione scheda ASR003	J3	Serial gate RS232 programming of board ASR003
Ingressi digitali:Comandi di movimento *- Morsettiere*		***Digital inputs:movement controls -*** *terminal board*
Apertura iride	M38	Iris Open
Chisura iride	M39	Iris close
Apertura 1 coppia lamelle rettangolari	M32	Open, first pair of rectangular shutters
Chiusura 1 coppia lamelle rettangolari	M33	Close, first pair of rectangular shutters

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Descrizione	contact	Description
Apertura 2 coppia lamelle rettangolari	M35	Open, second pair of rectangular shutters
Chiusura 2 coppia lamelle rettangolari	M36	Close, second pair of rectangular shutters
Rotazione oraria	M44	Clockwise rotation
Rotazione antioraria	M45	Counterclockwise rotation
Rotazione oraria	M47	Clockwise rotation
Rotazione antioraria	M48	Counterclockwise rotation
Comune +Vcc	M31/ M34/ M37/ M40/ M43/ M46/ M49/ M52/ M55	Common +Vcc
Ingressi Digitali: selezione formati - *morsettiera*		***Digital Inputs: format selection -*** *terminal board*
Selezione formato limite n. 1	M56	Format limit selection n. 1
Selezione formato limite n. 2	M59	Format limit selection n. 2
Selezione formato limite n. 3	M60	Format limit selection n. 3
Selezione formato limite n. 4	M62	Format limit selection n. 4
Selezione formato limite n. 5	M63	Format limit selection n. 5
Selezione formato limite n. 6	M65	Format limit selection n. 6
Selezione formato limite n. 7	M66	Format limit selection n. 7
Selezione formato limite n.8	M68	Format limit selection n. 8
Ingressi Analogici - *Morsettiera*		***Analogic Inputs -*** *Terminal Board*

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Descrizione	contact	Description
Lettura quota stativo e/o DFF singola		Stand position reading and/or single FFD
+Vpot/+5V	M86	+Vpot/+5V
Cur. Pot	M87	Cur. Pot
GND/0V	M88	GND/0V
GND/Schermo	M89	GND/Screen
Uscite: Contatti Di Segnalazione - Mosettiera		***Outputs: Signal Contacts*** *- Terminal Board*
OUT 5 - X-Ray: consenso raggi. Doppione di READY. Chiuso se il posizionamento automatico è concluso con successo e non ci sono errori.	M13/ N14/ M15	OUT 5 - x-ray: enabled. Double of READY. Closed if automatic positioning is concluded correctly without errors.
OUT 6 - CONSENSO RAGGI: doppione di hold. Chiuso se il sistema sta eseguendo il posizionamento o se il formato non riproducibile o se è in condizioni di errore.	M16/ M17/ M18	OUT 6 - X-RAY CONSENT: Double of hold. Closed if the system is performing positioning or if the format can not be reproduced or on error condition.
OUT 7 - ALLARME: chiuso se si è verificato un errore in fase di inizializzazione ed azzeramento assi (tipicamente timeout di azzeramento).	M19/ M20/ M21	OUT 7 - ALARM: Closed if a initialling or zero setting of axes has occurred. (zero-setting timeout).
OUT 8 - COMM: chiuso se si è verificato un errore in fase di comunicazione CAN tra ASR003 e CAN DC STEP	M22/ M23/ M24	OUT 8 - COMM: closed if a CAN communication error has occurred between ASR003 and CAN DC STEP.
N.B. Bloccare il cavo utilizzando la barretta fermacavi posta in prossimità della zona di collegamento.		**N.B. Block the cable using the cable-lock bar located in the connection area.**

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I - ELECTRONIC SYSTEM, DESCRIPTION:

Electronic Board CAN-DC-STEP (MP11719) controls a single stepping-motor through CAN Bus interface. Shutter movements of collimator R605DASM are controlled by three motors; this means that the collimator includes three boards MP11719.

Motor positioning is controlled via an open loop; i.e. impulse count sent to the motor, a direct function of the motor shaft movement.

Stepping-motor operation provides a quasi-trapezoidal speed/time profile, characterized by a starting speed (Vmin), acceleration time (TR), running speed (Vmax) and by deceleration time (Tr).

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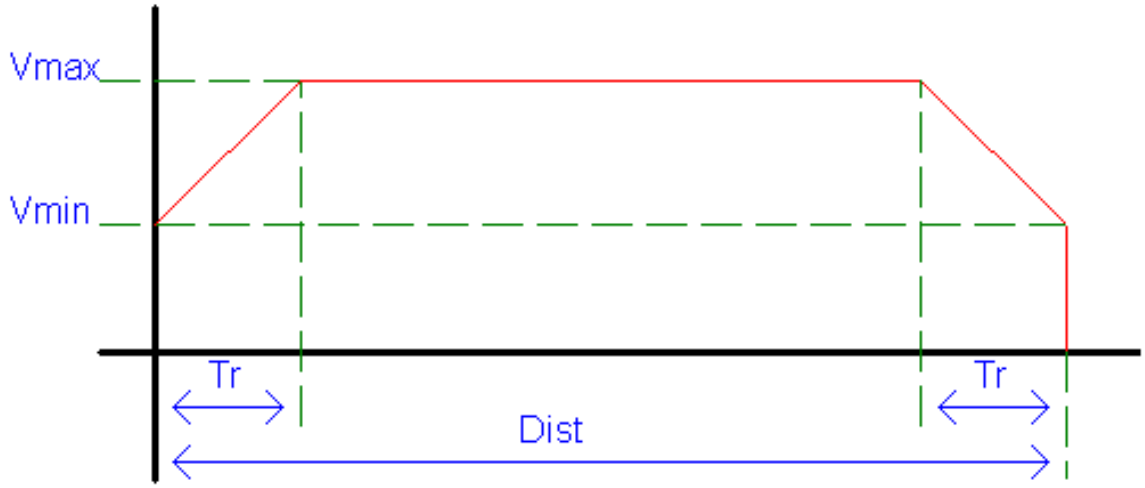

In the case of Dist travel lasting less than twice the ramp time Tr, running speed Vmax would not be attained. In this case instant speed would reach its maximum value at mid-run and then reduce again to Vmin speed at which point travel will stop.

Maximum current is set both by a trimmer situated on board and by CAN BUS setting over four levels between 50% and 100% of the value provided by the trimmer. Voltage in motor windings is controlled also in its damping stage and is adjustable over four levels.

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ELECTRIC CONNECTIONS TO THE BOARD:

JI - Programmazione/Programming

PIN	Descrizione	Description
1	Alimentazione +5V	Supply + 5V
2	Busy	Busy
3	SCLK	SCLK
4	RX livello TTL	RX level TTL
5	CE	CE
6	n.c.	n.a.
7	Alimentazione GND	Supply GND
8	Reset	Reset
9	CNVSS	CNVSS

J2 - Rete CAN-BUS / CAN-BUS network

R605DASM	
PIN	**Descrizione\Description**
4	CAN H
3	GND
2	CAN L

J3 - Fotocellule/Photocells

PIN	Descrizione	Description
1	Alimentazione +5V	Supply +5V
2	Ingresso segnale K	Input Signal K
3	Alimentazione GND	Supply GND
4	Alimentazione +5V	Supply + 5V
5	Ingresso feedback / home	Input Feedback/home
6	Alimentazione GND	Supply GND

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J4 - Display

PIN	Descrizione	Description
1	Alimentazione GND	Supply GND
2	Alimentazione +5V	Supply +5V
3	Contrasto	Contrast
4	RS lcd	RS lcd
5	RW lcd	RW lcd
6	EN lcd	EN lcd
7	n.c.	n.a.
8	n.c.	n.a.
9	n.c.	n.a.
10	n.c.	n.a.
11	D0	DO
12	D1	D1
13	D2	D2
14	D3	D3
15	Backlight +	Backlight +
16	Alimentazione GND	Supply GND

J5 - Motore / Motor

PIN	Descrizione/Description
1	Motore B-
2	Motore B+
3	Motore A+
4	Motore A-

J6 - Alimentazione / Supply

R605DASM		
PIN	**Descrizione**	**Description**
2	Alimentazione AC	Supply AC 24Vac
4	Alimentazione AC	Supply AC 24Vac

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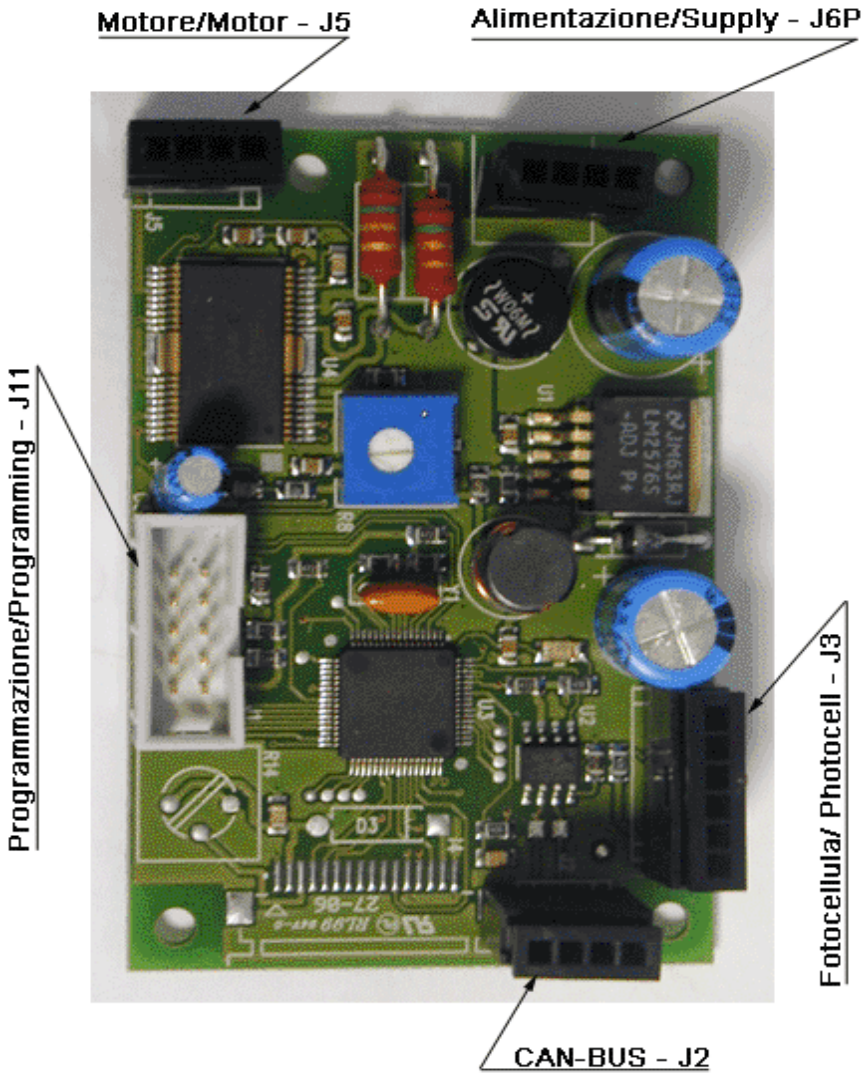
Figura 1- CAN-DC-STEP



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CAN BUS INTERFACE

Board interfacing makes use of six CAN BUS identifications (stepping-motor)..

ID	Tipo	byte	1	2	3	4	5	6	7	8	note
700h	Remote	8	'C	"S	"	"V	"1	".	"0	"3	'Modello / release
701h	Data out	5	P1	P2	P3	P4	ST 1	---	---	---	state
702h	Data in	1	00h	---	---	---	---	---	---	---	Home
702h	Data in	5	01h	D1	D2	D3	D4	---	---	---	Movim. assoluto
702h	Data in	5	02h	D1	D2	D3	D4	---	---	---	Movim. relativo
702h	Data in	1	FFh	---	---	---	---	---	---	---	STOP
703h	Remote	8	'S	"/	"n	'X X	XX	XX	XX	XX	N. serie
704h	Data in	5	M	K	T	D	L	---	---	---	Drive mode
705h	Data in	7	M	L1	L2	H1	H2	R1	R2	---	Drive speed
706h	Data in	1	O	---	---	---	---	---	---	---	Opzioni
707h	Data in	8	C1	C2	C3	C4	C5	C6	C7	C8	Display 1a riga
708h	Data in	8	C9	C10	C11	C1 2	C1 3	C1 4	C1 5	C1 6	Display 1a riga
709h	Data in	8	C17	C18	C19	C2 0	C2 1	C2 2	C2 3	C2 4	Display 2a riga
70Ah	Data in	8	C25	C26	C27	C2 8	C2 9	C3 0	C3 1	C3 2	Display 2a riga

P1,P2,P3,P4 = position at 32 bit P1 = bits 31..24

ST1 = status byte 1

D1,D2,D3,D4 = movement at 32 bit D1 = bits 31..24 absolute and relative

M = Mask, every bit determines a valid field

K = fraction of step

T = torque

D = decay

L = logical level per home

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L1,L2= start frequency (Vmin) L1 = bits 15..8

H1,H2 = running frequency (Vmax) H1 = bits 15..8

R1,R2 = ramp time Tr R1 = bits 15..8

O = options

C1 ..C16 = characters on the first line of the display

C17.C32 = characters on the second line of the display

ID - Identifications

IDs and some other parameters may be varied by an appropriate programme and serial interface and/or using other systems.

ID 700h (model)

This ID, sent as remote request makes the board return its p/n, eg.: " CS V1.03".

ID 701h (state)

This frame is sent by the board independently every 250 mS. In a binary form it contains: current position determined on the base of counts and a status Byte coded as 5° byte
Transmission may also be forced by using the Force Update option.

5° byte

2	2	2	2	2	2	2	2
Home	Riserv.	Riserv.	Riserv.	Riserv.	Pro-tez.	0 degrees	operat

- bit 0 is active during motor movement.
- bit 1 is is active in correspondence to the controller 0 angle.
- bit 2 is active on start-up prior to the first stop control; it is activated in case of over current or excessive heat of the device.
- In these cases the board must be switch **off** and **on** again.
- bit 7 is active is input zero signal is high (e' attivo se il segnale di zero in ingresso e' a livello alto (as if the fork photocell were obscured).

ID 702h (controls)

This frame is used to send movement control to the board. In relation to, the contents of the first byte we have four different controls.

00h home
Performs a re-setting cycle of a given movement according to minimum speed. During this operation the system ceases to communicate.
01h absolute positioning

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The subsequent 4 bytes represent the absolute position that needs to be reached in field 0 /1000000 i.e. 00 00 00 00 /00 0f 42 40. Any number exceeding this value is considered equal to the maximum value (1000000) of the domain.
The movement occurs at a quasi-trapezoidal speed profile; during the entire movement the status Byte of frame 701h signals that the system is moving and the position-related field is progressively updated.

02h relative positioning
The subsequent 4 bytes represent the relative movement that it has to be performed in field -100000/100000 i.e FF F0 BD C0/00 0F 42 40. Any number that is entered is added/subtracted to the current position and verified that it falls in domain 0-1000000.
The movement occurs at a quasi-trapezoidal speed profile; during the entire movement the status Byte of frame 701h signals that the system is moving and the position-related field is progressively updated.

Feh movement stop
Questo comando imposta forzatamente la posizione corrente al valore specificato dai 4 bytes successivi, deve essere inviato solo quando il motore non è in movimento.

FFh movement stop
This control stops the movement whatever the current position.

ID 703h (serial number)

This ID, sent as remote request makes the board respond with its S/n eg.: S/n_____.

ID 704h (drive mode)

This control sets some parameters related to the electromechanical system in question.

1°Byte (mask)
the scope of this byte is to select, wherever necessary, the parameters that require modification within the string. Il the respective bit is set at 1, the corresponding value is transferred. It will, otherwise be ignored by the system.
The mask is necessary since a single string contains a number of parameters and only a third or whatever combination might want to be transferred as valid. In this case, parameters corresponding to non-selected positions (zero mask bits) will be ignored and may then assume any value.

1° Byte.

2	2	2	2	2	2	2	2
Riserv.	Riserv.	Riserv.	Riserv.	Home P.	Damp.	Torque	Frac.

Example: if set at 0fh, all the ensuing fields are considered valid; if set at 02h the torque-related value only will be extracted from the string.

2°Byte (Step fraction)

The scope of this byte is to set the fraction required which may be chosen from:

00 =used only to cut-off supply to the motor. It makes sense only in the case of an complete step otherwise, actual position within the fraction itself would be lost. The reason is that a motor stopped over a step fraction must be energised.
01 =invalid NEVER USE
02 =invalid NEVER USE
03 =entire step
04 =half step at low torque
05 =half step at high torque
06 =quarter of a step
07 =eighth of a step
08 =sixteenth of a step

NOTE:
THE EXESSIVE MOTOR AND BOARD HEATING CAN CAUSE THE COLLIMATOR SHUTTERS TO BLOCK. THE OVERHEATING IS CAUSED BY A CONTINOUS 100% SUPPLY OF HIGH VOLTAGE. IT IS ADVISED, WHEN THE MOTOR IS STOPPED, TO LOWER THE HIGH VOLTAGE RISE AS SHOWN BELOW.

3°Byte (Torque)

The scope of this byte is to set the maximum torque fraction required:

00 = 50% of the maximum value (160mA - 225mA)
01 = 70% of the maximum value (225mA - 315mA)
02 = 85% of the maximum value (270mA - 380mA)
03 = 100% of the maximum value (320mA - 450mA)

These values ca be set by string sent to board even when it is working.
00 = 07x4 5 02 670067 67
01 = 07x4 5 02 670167 67
02 = 07x4 5 02 670267 67
03 = 07x4 5 02 670367 67

4°Byte (voltage decay)

The scope of this byte is to set phase voltage decay required:

00 = 12.5% low decay coefficient
01 = 37.5% medium decay coefficient
02 = 75% high decay coefficient
03 = 100% rapid decay coefficient

These values ca be set by string sent to board even when it is working
00 = 07x4 5 04 676700 67
00 = 07x4 5 04 676701 67
02 = 07x4 5 04 676702 67
03 = 07x4 5 04 676703 67
Wher x is a base value.
Base ID 720 724 x=2

5°Byte (Logical level of the home sensor)
The scope of this byte is to set the logical level for the input of the home sensor when the system is in the home position.
In the case of connection to a fork photocell, this value must be set at 00 for the photocell that is obscured at zero position (occupied slot) or set at 01 for the photocell that receives light a zero position (free slot).

ID 705h (drive speed)

This controls sets some parameters related to the speed of the electromechanical system in question.

1° Byte (mask)
The scope of this byte is to select, wherever necessary, the parameters that need to be modified within the string. If the respective bit is set at 1, the corresponding value is transferred, otherwise it will be ignored by the system.

$$\frac{60 * Freq}{K * P}$$

The mask is necessary since a single string contains a number of parameters and only a third or whatever combination might want to be transferred as valid. In this case, parameters corresponding to non-selected positions (zero mask bits) will be ignored and may then assume any value

1° byte.

2	2	2	2	2	2	2	2
Riserv.	Riserv.	Riserv.	Riserv.	Riserv.	Rampa	F.max	F.min

2° e 3° Byte (Frequenza minima)
The scope of this byte is to set the minimum frequency corresponding to the motor start-up speed. Set value is in Hertz, minimum value is 125 Hz.
The corresponding angular speed is a function of the following equation:

R.p.m. =

where K is the step fraction and P the number of stepes per revolution.

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Example:
Motor 200 step/turn, set at a quarter step.
Start-up frequency set at 500 Hertz
Corresponding turns = 37.5 r.p.m.

since the stepping-stepping motor features a torque that reduces with the speed the a correct selection of this value makes the best of the motor characteristics.

4° e 5° Byte (Frequenza massima)
The scope of this byte is to set the maximum frequency corresponding to motor running speed. The set value is in Hertz, maximum value is 20000 Hertz.
The same considerations made for the minimum frequency apply. For the same reason, maximum frequency must not exceed the speed value at which the motor maintains a useful torque; a stall fault would otherwise occur resulting in loss of position.

6° e 7° Byte (Ramp Time)
The scope of this byte is to set motor acceleration and deceleration times in milli-seconds which is the time value necessary to pass from minimum to maximum speed.
A too short a value could cause a stall fault; on the other hand an excessive value could enhance resonance phenomena, both electrical and mechanical, which could also cause stall faults.
A correct value allows a load/motor to accelerate and the system inertia allows speeds at which the system resonates without entering a stall condition.

ID 706h (Options)

This control serves to set some board operation options. These are PERMANENT options which means that they will still be in place even without power supply; they are normally used in the board installation phase.

It will be possible to change these options at least 100 times.

1°Byte (Option 1)

There are five fields:

1st field: LCD, refers to the possible use of a liquid-crystal display connected to the appropriate port.
Set at 1 the appropriate display is connected - set at 0 the display in not available

2ndfield: refers to the board-mounted LED operation modes:
- 00: Status display of Home sensor.
- 01: flashing at 1 Hz indicating board operation.
- 10: motor status; on = in movement , off = stopped
- 11:receipt of a valid CAN frame.

3rd field: possibility of moving upwards the addresses of the board output frames by a value equal to 0x80 when the field is set at 1.

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4th field: consents the use of the second display line by suppressing the automatic value display. When set at 0 the value is displayed, when set at 1 the area may be used to send text via CAN BUS.

5th field:

Set at 1, this field forces transmission of ID 701h even in the presences of a movement control and movement actuation.

The above details refer to standard firmware installed on the board for the STEPPING-MOTOR VERSION.

Controls:

After having connected the external devices to the board and, set up stepping-motor voltage by means of trimmer R8, the board needs to be tested for CAN BUS net interrogation response.

The standard versions frame 701h, composed of 5 bytes, is sent automatically every 250 msec.

Receipt of this frame indicates correct CAN BUS net connection.

We start by sending **ID=700h DLC 8**; the board should reply with a string corresponding to the model.

We can then transmit control ID=703h DLC 8 to obtain the board serial number whenever necessary.

Frame 704h DLC = 5 is transmitted with the appropriate values bearing in mind that, if we want the board to consider the 4 parameters, the mask (1st byte) to be sent will be 0Fh.

This frame is not normally sent again

Frame 705h DLC =7 is then sent with values related to the two speeds (frequency) and acceleration time.

In this case also, the mask byte (07h) must be supplied.

Supposing we want a start frequency of 200 Hz and a running frequency of 1000Hz, acceleration time between the two frequencies of 300 mSec, we would send the following string: (besides ID e DLC) 07h 00h c8h 03h E8h 01h 2Ch.

We might want to perform a movement at a different running speed for some particular reason, eg.: running= 1500Hz. The string would be 02h 00h 00h 05h DCh 00h 00h.

The underlined digits can contain any value since, because of the mask 1st byte, they are not considered.

The same consideration applies to the variation of one or more parameters.

The correct procedure is now to send a re-set control to the motorised axis. To do this we send the following frame:

702h DLC = 1 with the 1° byte (type of movement) = 00h

Wait for the re-setting cycle to terminate

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We can now, for example, send an absolute position control to get the actuator to move to position 5000. Following is the corresponding frame:

702h DLC = 5
01h 00h 00h 13h 88h

Frame 701h will now provide immediate information on actuator position (first 4 bytes)and the field relating to the 5th byte (movement status related) will remain at 1 until position is reached.

Should we now wish to move forwards by 400 points (relative movement):

702h DLC = 5
02h 00h 00h 01h 90h

In this case also we will monitor the status frame (701h) which will indicate movement status and ABSOLUTE axis position.

Let us now move by -1000 points;i.e. backwards with respect to the current position:

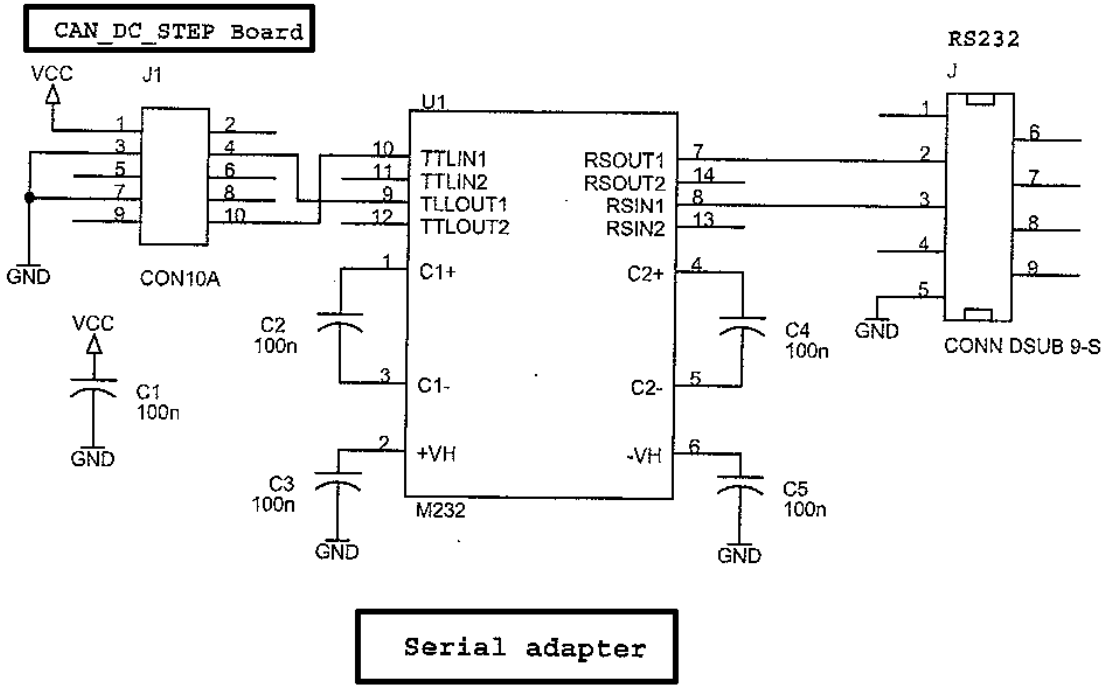
702h DLC = 5
02h FFh FFh FCh 18h

We might need to stop the movement so we'll send:

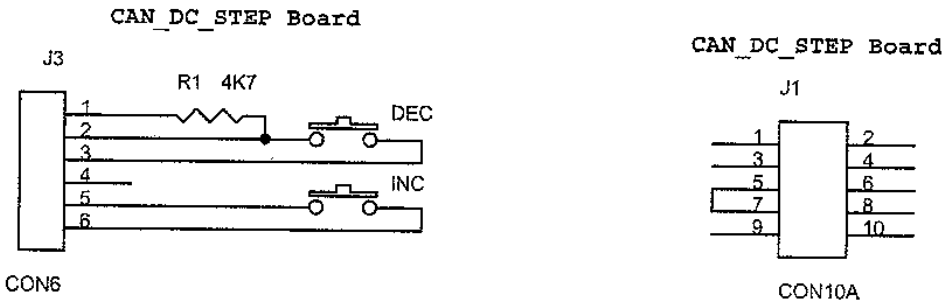
702h DLC = 1
FFh

The resulting position must be determined by the reading of frame 701h.

It is not normally necessary to perform a HOME procedure for the movements. It is sufficient to send an absolute movement control to position 0: this is faster than the re-setting process.



Serial adapter



Programming pushbuttons adapter

Procedure

With the board powered down, connect the serial adaptor to the connector

- Power up
- Use the increase and decrease buttons to read the desidered value by 10h steps on the upward/downward scale.
- Remove the serial adaptor on connector J1.
- Swtich the board off and remove the adjustment wiring.

The board is now ready to react to a new set of addresses.

A serial adapter may optionally be installed on connector J1 for a set of customised controls:

The board is must powered down: connect the serial adaptor on connector J1 and then to an ASCII terminal or PC featuring and appropriate terminal emulation programme) setting the following:

- Baud rate 9600
- 1 stop bit
- No parity
- Power up

Some parameters related to the board may now be read/changed as follows:

Control	Example	Description	Min	Max	Notes
Base_id	0x200	Basic address, board	0x100	0x7F0	
Update_rate	200	interval status transmission	0	255	if < 100 it is suppressed
Lcd	1	LCD in	0	1	See options, above
Led	2	LED operation	0	3	See options, above
Serial	Nessuno	Board S/N	0	99999	riserved
Can_prop	1	CAN propagation segment	1	14	(*)
Can_ph1	5	CAN phase 1 segment	1	14	(*)
Can_ph2	5	CAN phase 2 segment	1	14	(*)
Can_swj	1	CAN sync jump	1	14	(*)
Can_speed	0	CAN bit rate prescaler	0	3	(*) (**)
Offset	1	CAN data out offset	0	1	See options, above
Row_2	1	Availability 2nd Display line	0	1	See options, above
Help / ?	-	Available control indications	-	-	Also indicates firmware version

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(*) random variation of these parameters could make the CAN-BUS inaccessible.

(**)legal values are:

0 = 500 Kbit/sec

1 = 250 Kbit/sec

2= NOT VALID

3 = 125 Kbit/sec

The control may be given in two ways: read only or setting.

An example of the read only is:

Base_id<cr>

The value of of this parameter will be viewed.

Or:

Base_id = 0x540

The value of this parameter will be varied. An inexistent or wrong control will return an Invalid command response. Wrong parameters could return an Invalid value response.

Warning!

These parameters are permanently memorized in the microprocessor FLASH memory and are retained even on powering down.

The FLASH memory has a finite number of operations consequently these settings are advisable only when strictly necessary. Values set beyond the limits indicated will not be memorised.

When setting is terminated, power down the board, remove the connections. On start up, the board will operate with the new settings.

Warning!

The optional bit related to the LCD display may be set at zero only also in versions designed for LCD display operation. Should a fork photocell type OPB840W51 need to be connected (J3), proceed as follows:

Pin 1 not connected
Pin 2 not connected
Pin 3 black
Pin 4 red
Pin 5 white
Pin 6 green

Resetting to 1 may be performed only in the factory.

J - ASR003 - EXTERNAL BOARD DESCRIPTION

Characteristics:

- Manual interface
- Potter Bucky Potentiometres interface.
- Vertical Focus-Film distance interface (FFD/SID) with potentiometers related to table and stand.
- Interface with 5 fixed lateral distances.
- Interface for general controls; e.g., open/close for shutters, tomography. See the specifications regarding this point described in this chapter.

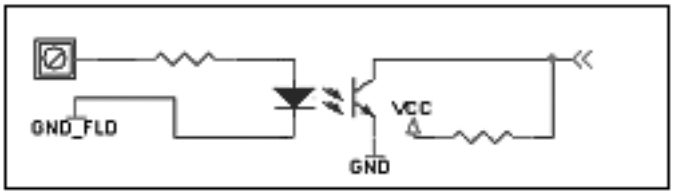
Description:

Board ASR003 is an extension of the radiological system. It provides interfacing with the collimator which features board CAN DC STEP and analogic signals coming from other system devices.

It operates via CAN BUS with a Ralco proprietary protocol.

The user end features 32 digital inputs, 8 analogic inputs and 10 relay outputs.

So as to adapt to different devices, digital inputs are fixed for optioinsulation so as to allow connection also with devices that supply output control voltages (typical range 12-32 Vdc).



Ingresso digitale/digital Input

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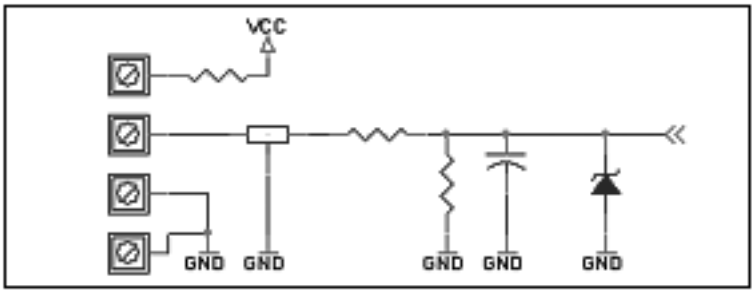
Since the input signal sometimes comes from a voltage-free contact, the board features a number of pins to which an external supply may be connected. Alternatively these pin may be connect to a voltage incoming from board ASR003 itself by simply connecting pin M79 to pin M80 and pin M81 to pin M82.

The available voltage is not taken upstream of the voltage regulator but downstream of the fuse and rectifiers bridge.

The type of software applied determines the function of each input.

ASR003_descrizione.fm

The analogic inputs are designed mainly for connection to 1Kohm potentiometers.



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Ingresso analogico/analogic Input

In this case the input range will be reduced with respect to the digitalization capacity of the digital/ analogic convertor on the microprocessor. However, at the same time the board will be better protected against wrong Potentiometres connections.

Other protection elements have also been added since, here too, it is possible that the user does not employ Potentiometres but supplies an analogical signal directly.

The main purpose of these inputs is to furnish the collimator with the cassette sizes that may be present or, to supply information related to focus-film/focus- floor distances (depending on the configuration).

In general, non linearity introduced by the protection elements is contained and adequate to their functions. However, should a greater degree of precision be required (such as in the case of focus-film/focus-floor signals) we suggest that a voltage proportional to the case be supplied which is included between 0 and 6 Vdc so as to make the most of the convertor range.

Higher voltages that could occur from incorrect connections, up to 12V, will not damage the input.

the 10 output relays each have a voltage-free exchange contact and may consequently be adapted to a number of different configurations. Their use depends on the software applied.

The CanBus communication interface is opto-insulated and needs external supply with a direct voltage between 9 and 32Vdc.

In this case also, voltage for interface supply may be drawn from any one of the radiological system supply sources or from an external source.

This type of connection is recommended when there are problems related to the presence of differences in earth potential within the system. See the typical connections diagrams that follow in this section.

This board also supplies the go-ahead to programme some of the radiological system parameters. In this case a jumper is required on the board as shown in the following photograph.

ASR003_descrizione.fm

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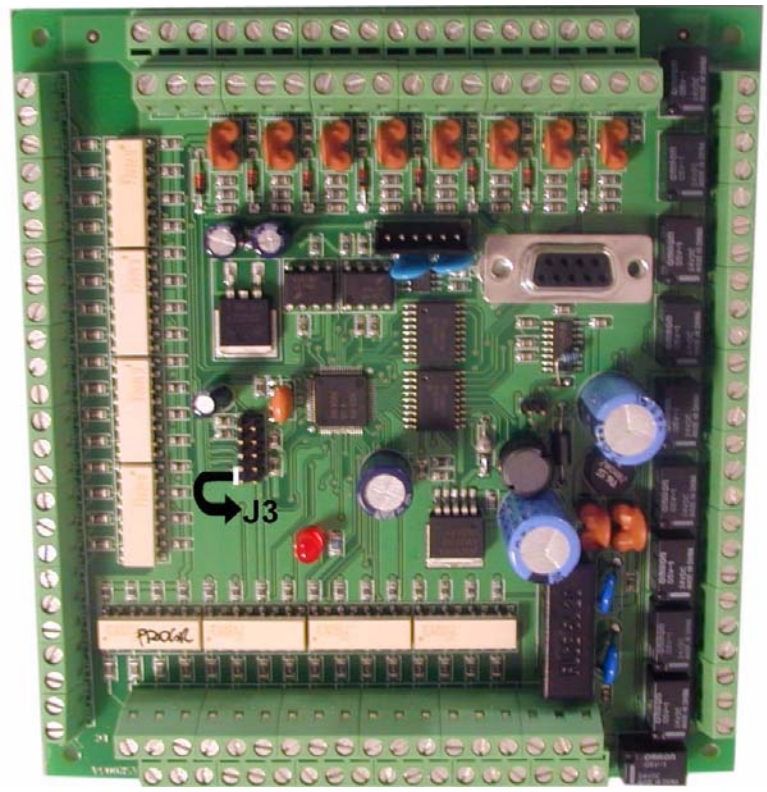


collimatori\acs\asr003_3.jpg

The white line and black arrow indicate where to position the jumper on board ASR003; this requires the connection of pins 2 &4 of connector J3.

No other configuration must be employed otherwise permanent damage might be caused to the board itself.

The jumper must be removed according to indications provided by the collimator display.

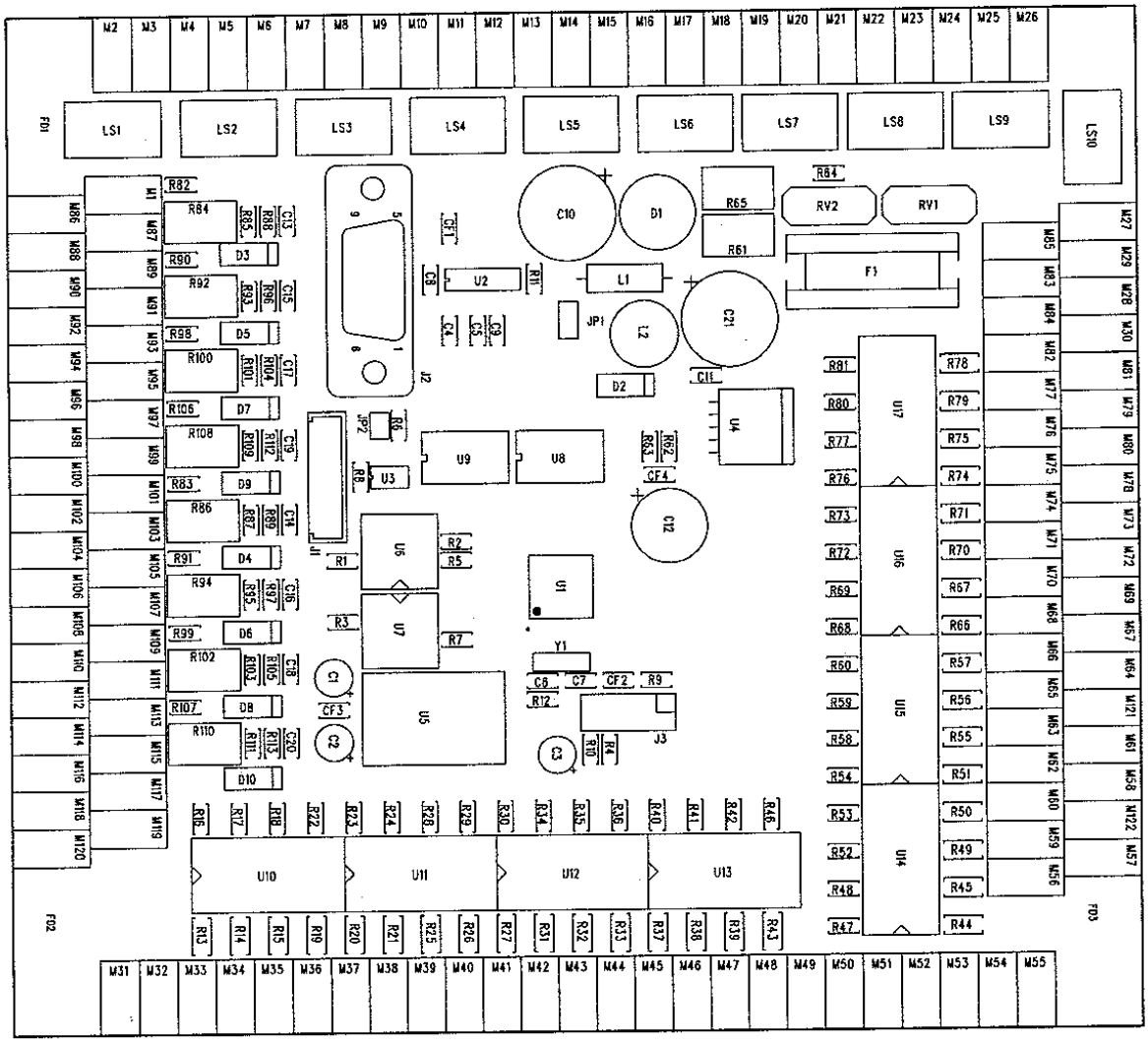
J3 is a utility connector used for in-factory programming of board ASR003.

Some software versions could also cover the use of a serial RS232 port located on connector J2 for a possible OFF-LINE parameterization of the board itself.

ASR003_descrizione.fm

ASR003 - WIRING DIAGRAMS/DISEGNI ELETTRICI

Figura 1



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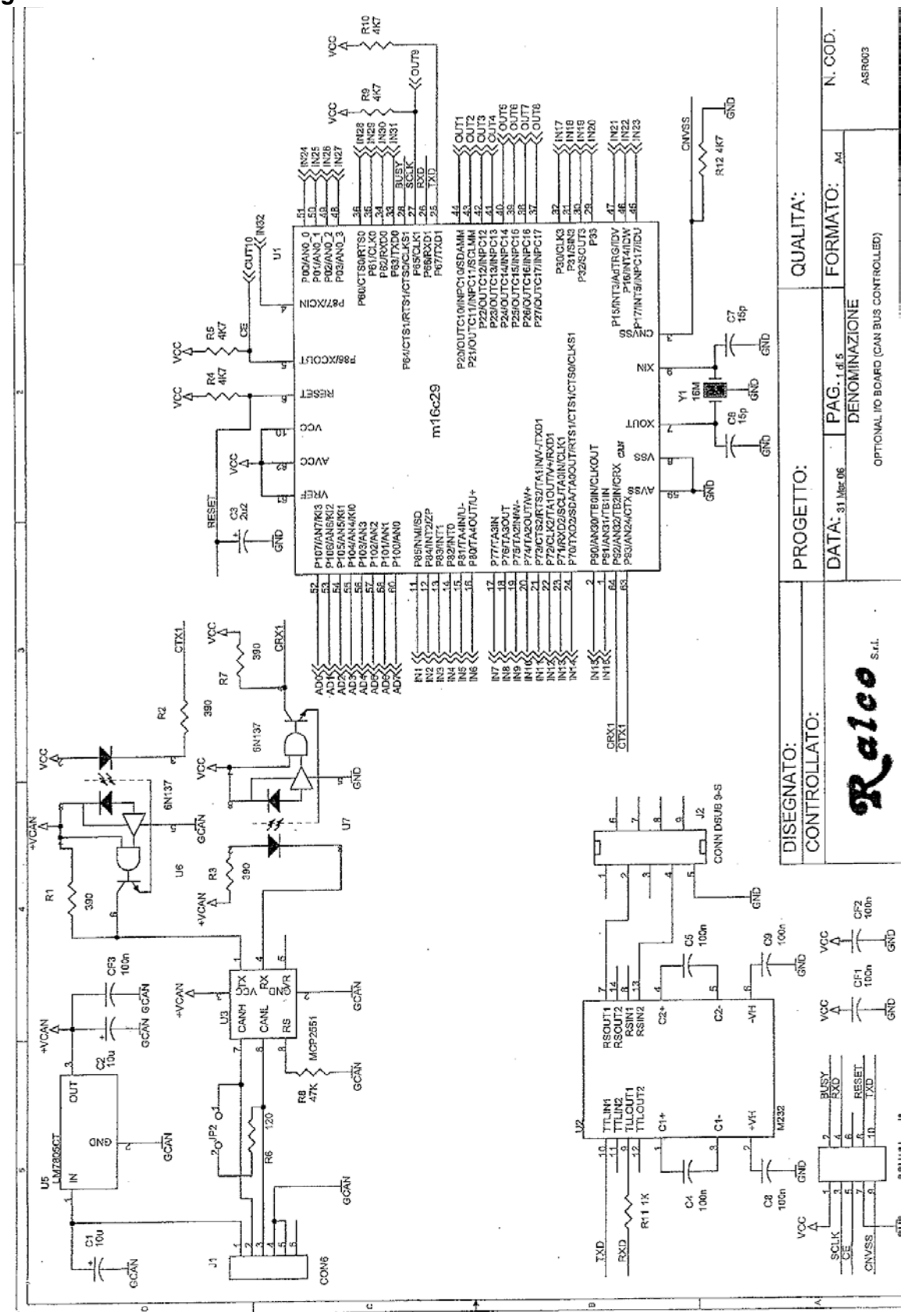
ASR_003_dis_elett.fm

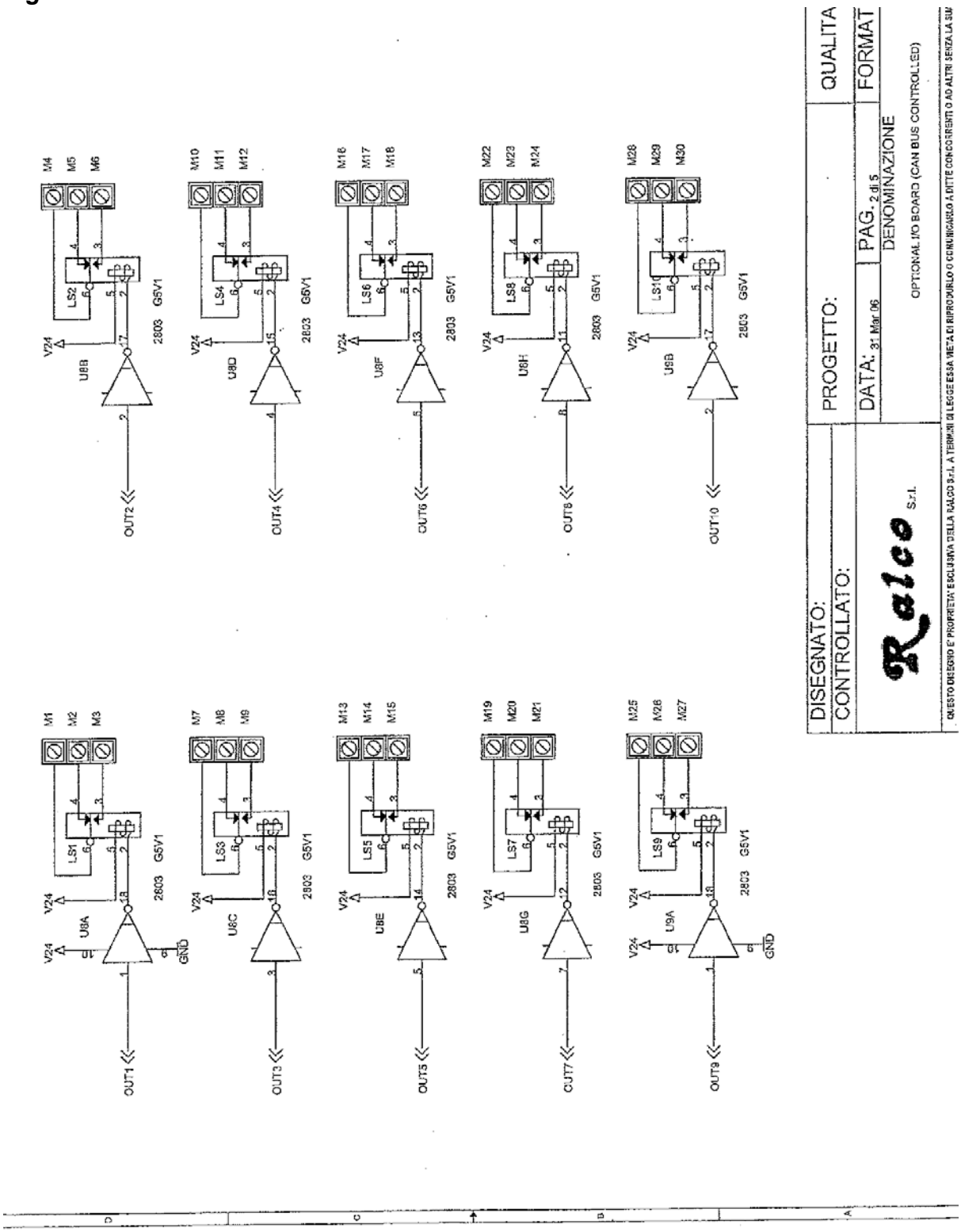
Figura 2



collimatori\acs\elett_2_asr003.gif

ASR_003_dis_elett.fm

Figura 3



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ASR_003_dis_elett.fm

Figura 4

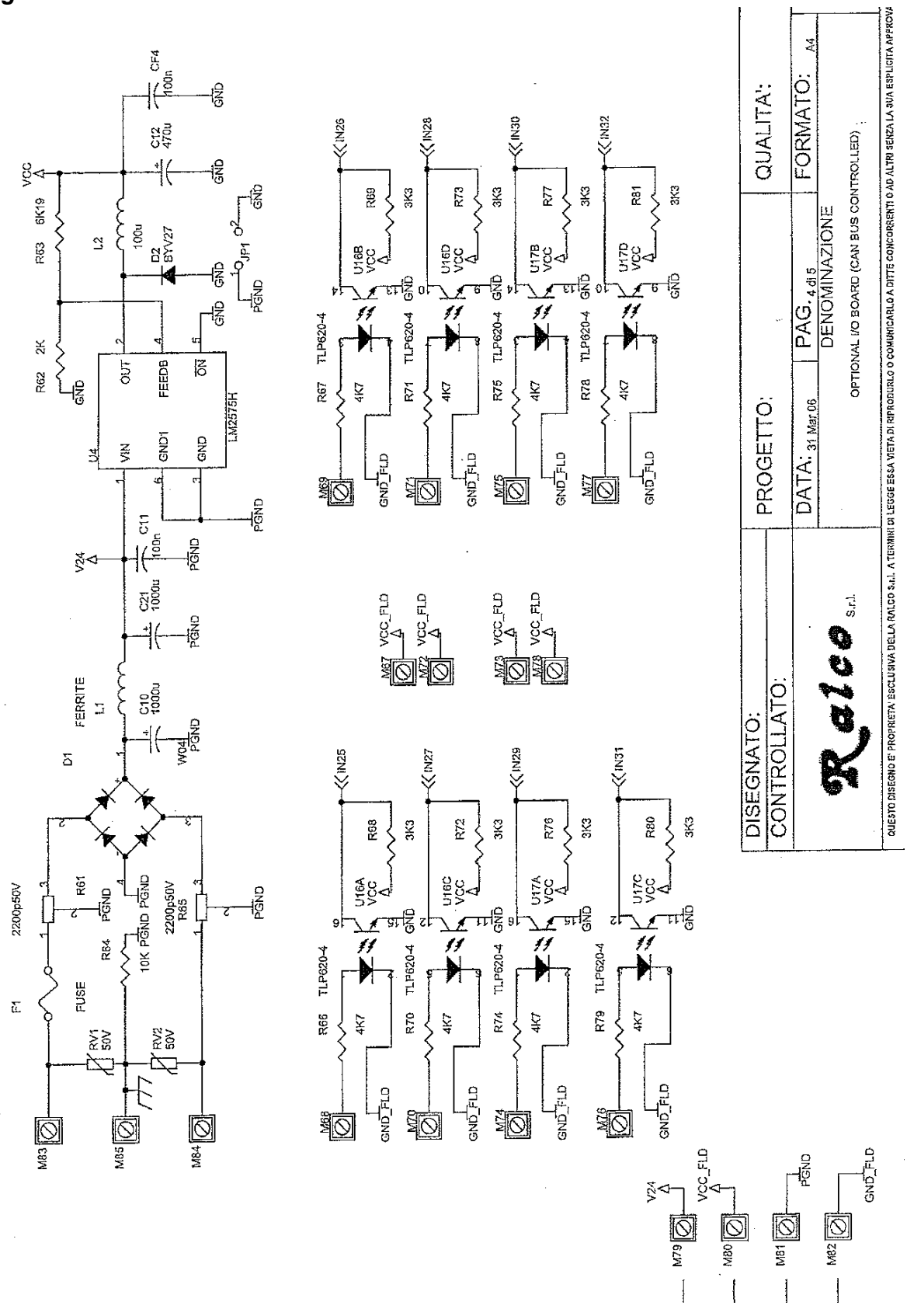
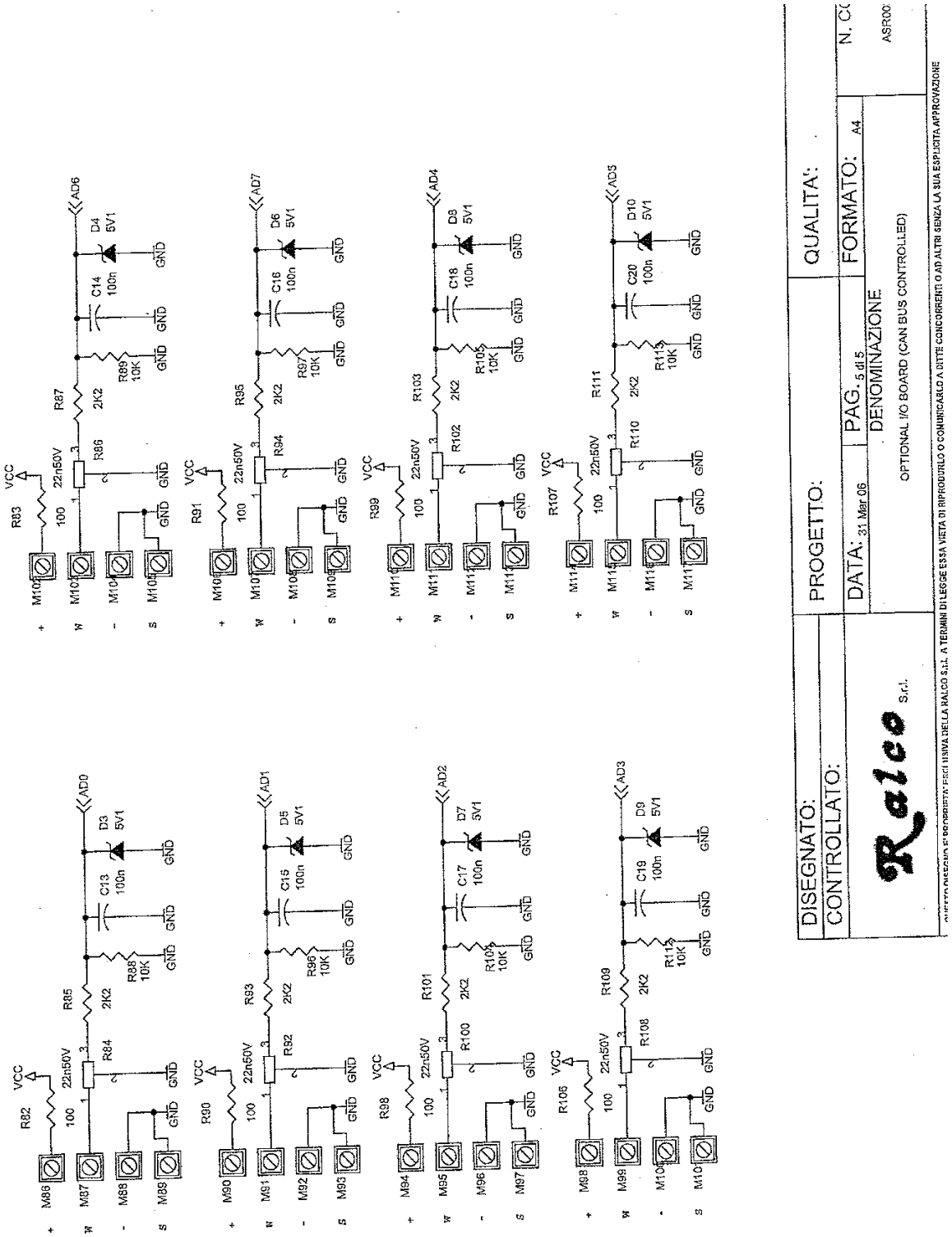

DISEGNATO:
CONTROLLATO:
PROGETTO:
DATA: 31 Mar 06
PAG. 4 di 5
QUALITA':
FORMATO: A4
DENOMINAZIONE
OPTIONAL I/O BOARD (CAN BUS CONTROLLED)
Ralco S.r.l.
QUESTO DISEGNO E' PROPRIETA' ESCLUSIVA DELLA RALCO S.r.l. A TERMINI DI LEGGE ESSA VIETA DI RIPRODURLO O COMUNICARLO A DITTE CONCORRENTI O AD ALTRI SENZA LA SUA ESPLICITA APPROVA
F1
FUSE
2200p50V
RV1 50V
RV2 50V
R61
R64 10K
R65
D1
FERRITE L1
C10 1000u
C21 1000u
C11 100n
C12 470u
CF4 100n
L2 100u
D2 BYV27
JP1
R62 2K
R63 6K19
U4 LM2575H
VIN
GND1
OUT
FEEDB
ON
GND
VCC
V24
PGND
W04
M83
M85
M84
M79
M80
M81
M82
M67
M72
M73
M78
M69
M71
M75
M77
M68
M70
M74
M76
IN25
IN26
IN27
IN28
IN29
IN30
IN31
IN32
U16A
U16B
U16C
U16D
U17A
U17B
U17C
U17D
R66
R67
R68
R69
R70
R71
R72
R73
R74
R75
R76
R77
R78
R79
R80
R81
TLP620-4
4K7
3K3
GND_FLD
VCC_FLD

Figura 5



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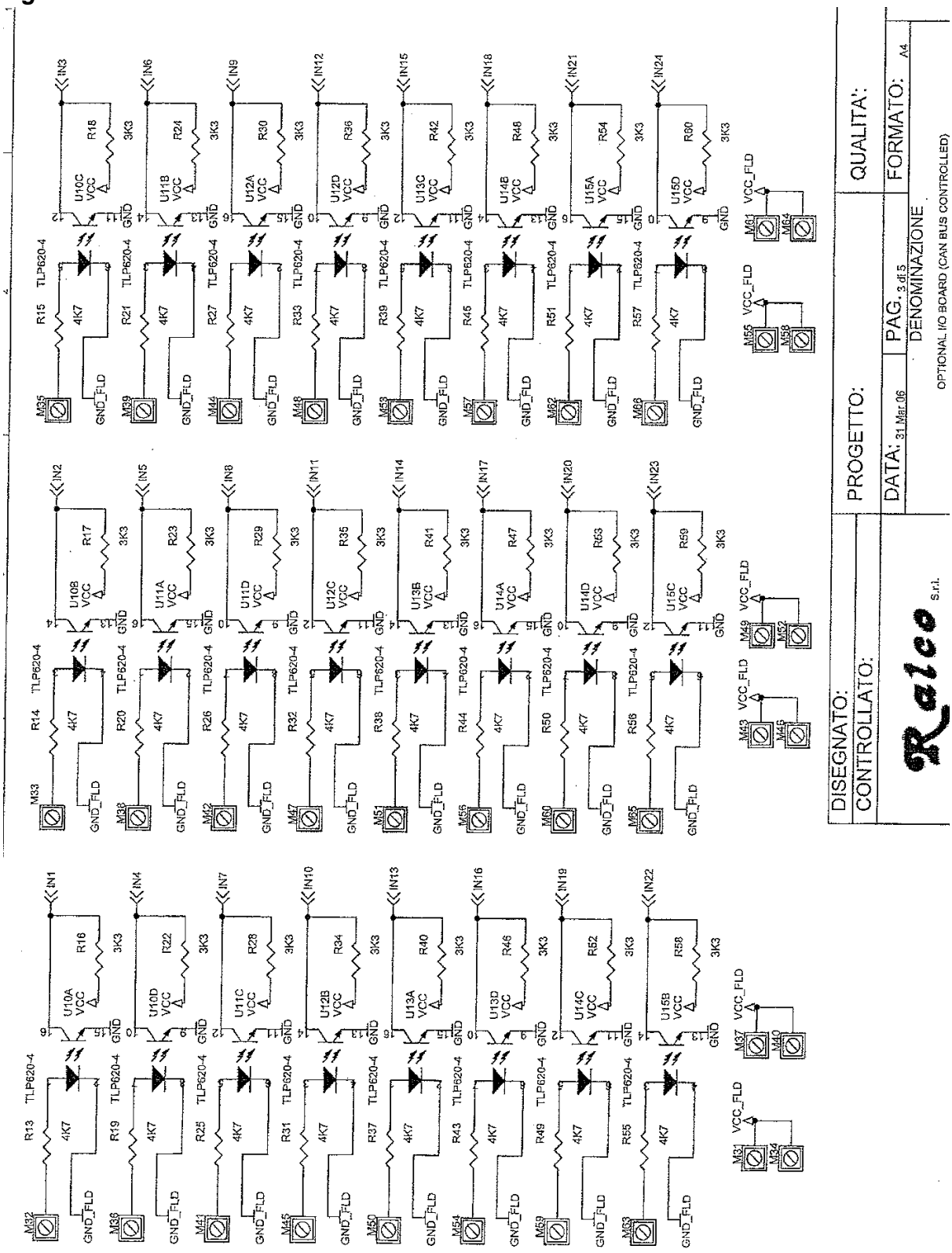
ASR_003_dis_elett.fm

Figura 6



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ASR_003_dis_elett.fm

K - ASR003 BOARD

ASR003 board is the central control unit for collimator R 605DASM.

Configuration

This board features ample configuration possibilities. To access configuration, connect to serial gate J2 via CAN communication protocol.

FFD CONFIGURATION

Stepless single: FFD value is obtained locally by readings of board analogic inputs. It may also be received in millimetres directly via CAN-Bus. The collimator continuously tracks FFD value for reproduces a format of constant dimensions on the receiver/plate.

FFD Measuring Source:

The value of a stepless FFD may be determined locally, readings of ASR003 inputs, or received via CAN-Bus in digital format from external equipment.

Focus Distance:

All the calculations performed by the collimator require an 80mm F-D (Focus Distance). If the mounting distance of the collimator is not 80mm, the correct value may be specified.The parameter may also be used to correct small defects in the measurement of projected formats.

Hystereris on FFD change

This is a small millimetric variation to the FFD which triggers format correction when it is detected by the analogic inputs of ASR003.

FFD Observation time

Through the analogic inputs, measured FFD is tracked until each variation becomes smaller than the hysteresis and the time limit has expired. The collimator starts to retrack FFD variation only when the variation exceeds the hysteresis window.

FORMAT CONFIGURATION

Format programmes:

8 format programmes are available. Each programme includes limit values for the open of Iris, Long, Cross filtering shutters and a rotation angle for the filtering shutters. Once a format is selected, the collimator positions the iris, long and cross and filtering shutters as indicated by the programme: It will now be possible to close the field but not open it further.

asr003_605.fm

Format Selection Mode:

The format may be selected from 8 pre-set values but may also be modified. In the latter case the values are received via CAN-Bus (in millimitres or sexagesimal degrees) for Iris, Long, Cross.

Format Source

Allocation of one of the 8 pre-set formats may be local by activating one of the board digital inputs or remote via CAN-Bus.

Allocation of individual format measurements is remote only.

CONFIGURATION OF MANUAL MOVMENTS CONTROLS

Movments controls:

A good number of the board digital inputs are dedicated to the control of manual movements: it is possible to open/close the projected field, rotate shutters, perform standard position of filters ect..ect.

Alternatively, these controls may be received by a remote unit via CAN-Bus.

FFD Mode

FFD value is obtained locally from readings of analogic inputs. It may also be received in millimetres via CAN-Bus. The collimator continuously tracks FFD value to reproduce a format of constant dimensions on the receiver/plate.

FFD Variation from 78 cm to 120 cm

OPERATION MODES

Axes Reset modes:

When the boards are powered-up, the system automatically selects, through a memory, the mode of the previous exam and starts the axes resetting procedure, if there is no error (timeout zero set or comunication error). All axes linked to fixed format are positioned on the first format (Iris movement, long, cross, F1,RF2, F2, RF2)

Calibration Mode:

This mode serves to calibrate potentiometers for FFD measurement (whenever this configuration is applicable).

Insert jumper JP at any moment to access this mode.

Calibration proper starts when the configuration is in the following status:
- FFD acquisition in stepless mode (single or differential)
- FFD measurement acquisition by potentiometer readings through analogic inputs of ASR003.

asr003_605.fm

Manual Mode:

This is the primary operation mode of the collimator.

Further to the configuration given to the system, the collimator determines set format projection (with correct millimetric and rotation values) at a given FFD.

The format is selected from 8 preset dimensions or is received via ModBus or CAN-Bus.

Manual movements are controlled and limited to the selected format. It is possible to perform adjustments on open/close and rotation by 1mm and 1° at a time

Note: The movements are at the operator's discretion and are not influenced by the FFD.

Error Mode:

An Error occurs upon system operation anomalies. The following tables serves to troubleshoot the causes:

Error Type	Problem description	Solution
Memory Access Error	The permanent memory has been damaged or its contents have been corrupted. Very rare occurrence.	Ask for technical assistance.
CAN DC STEP fails to respond to the reset control.	On power-up CAN DC STEP transmits the end stop search control to the ASR003 boards. If a confirmation is not produced, an error will set in.	A probable cause is faulty CAN connection or faulty supply to the CAN DC STEP boards. Check on these connections.
End stop search time-out.	CAN DC STEP has received control to reset but one or more movements have failed to receive the relative en stop within the allotted time - 10s for simple movements, 30 s for two-motor movements,I	Observe the LEDs on CAN DC STEP. Flickering Leds indicate the end stop that has timed out: Check on electric and mechanical connections of the end stop; check that mechanisms are not blocked.

Error Type	Problem description	Solution
Communication Error on Service CAN	Once initialisation has terminated and movements have been re-set, ASR003 expects to receive data regularly from CAN DC STEP. An error will set in if this transmission does not take place and COMM relay will be activated.	Probable causes: interruption of CAN-Bus line of supply to boards CAN DC STEP.

Default formats

Format number	*Inch*	*Filter rotation 1*	*Filter rotation 2*
1	12	90°	0°
2	9	90°	0°
3	7	90°	0°
4	6	90°	0°
5	4	90°	0°
6	3	90°	0°
7	8	90°	0°
8	2	90°	0°

Nota: Format programmes need do not contain position values for the strip of 4-position filters. These are always controlled manually and left to the operator's discretion.

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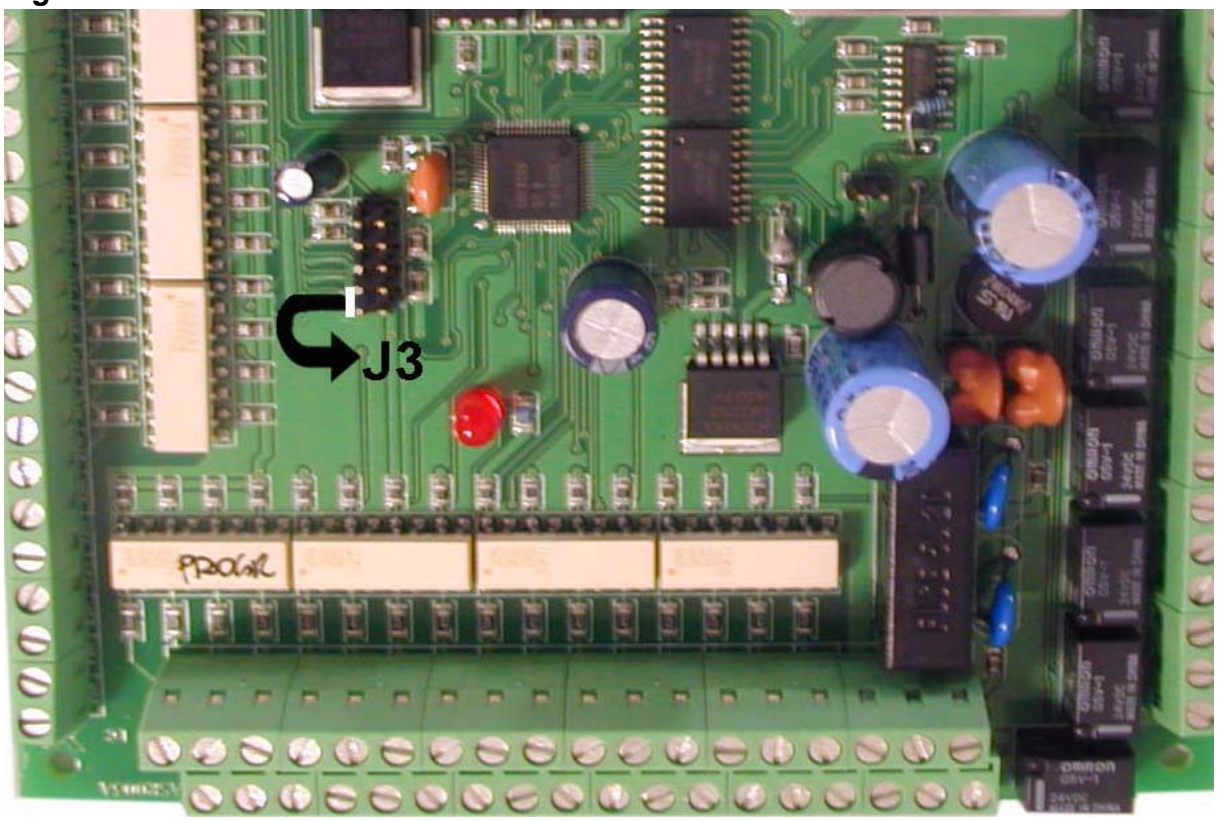
ASR003 - CALIBRAZIONE\CALIBRATION

Calibrazione della scheda esterna	External board calibration
Mettere il Jumper JP2 sulla scheda ASR003 tra i pin 2 e 4 della fila sinistra del connectore J3 iniziando il conteggio dal pin inferiore - vedi **Figura 1.**	Place jumper JP2 on board ASR003 between pins 2 and 4. The white line and black arrow indicate where to position the jumper on board ASR003; this requires the connection of pins 2 &4 of connector J3. See **Figure 1**

Figura 1



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Calibration procedure

The calibration procedure needs to define the relationship between the stand and the variation of the potentiometer signal to determine position values for FFD calculation.

The relation between the movement and the signal must be linear. Power up the board and wait for collimator reset to be concluded.

At this point insert jumper between pin 2 and 4 of S3 to start the actual calibration.

Attention: Calibration will not initiate if configuration is not correct.

During calibration ASR003 makes use of manual control pushbuttons and some relays as described in the following table:

Element	Function description
Input	
Iris close pushbutton (terminal M2)	The board performs the measurent, saves the results for table and/or stand position.
Iris open pushbut-ton(terminal M1)	Allows to return to previous calibration step and repeat the process if necessary.
Output	
MANUAL relay	Intermittent operation over 1 s periods to indicate that the board is on standby for the operator (depending on the calibration step).
ERROR relay	Activated if an error is detected. In case of an error the board sets to the point where the error occurred. Exam-ple: if at step 2 the table is lowered instead of being raised, an error is signalled and the board requires the correct table position instead of going to step 3).

The procedure must be as follows:

1. Switch on collimator and wait for the correct setting of initial procedure and axes reset of all boards. Collimator will automatically achieve pre-defined format and will be ready to accept all external signals.
2. Insert the jumper between 2 and 4 pin of J3 programming connector of ASR003 control board. At this point all operations on the board will be inhibited and it will be possible to start the calibration procedure.
3. Correct insertion of jumper will be signalled by blinking led of the relay every sec-ond that controls MANUAL output.
4. At this point the system indicates the first calibration phase by activating output 1 and deactivating inputs 2 and 3.
5. Bring FFD to 78 cm and activate input 2 of the board (M39 IRIS CLOSE). When input pushbutton is released the average measurement of the signal coming from FFD potentiometer will be achieved on the system. Subsequently the signal will be compered to absolute minimum value in order to evaluate the measurement taken and saved.
6. At this point the system will deactive output 1 and active input 2 in order to show that it is ready to obtain the second measurement. Bring FFD to 100 cm and repeat action by activating input 2 (M39 IRIS CLOSE).

7. The system will obtain the value and make the controls compared to previous values; it will then activate output 3 and deactivate output 2 in order to indicate it is ready for the third operation.
8. Operator must set FFD at 120 cm and re-activate input 2 (M39 IRIS CLOSE), the system usually follows up the control.
9. At the end of third operation, the operator can permanently save the obtained data by re-activating inputs 1, 2, 3.
10. At every step of measurement, operator can decide to return to the previous input 1 (M38 IRIS OPEN). In this way the data can be replaced without repeating the whole procedure. In other words, if 78 cm is achieved during the first step, because it is the first step, it will not be possible to return to the previous phase, but in the phase 100 cm it will be possible to return to 78 cm and from 120 cm phase it will be possible to go down to 100 cm

L - SYSTEM CALIBRATION

WARNING:
THE FOLLOWING PROCEDURES REQUIRE THAT X-RADIATION BE PRODUCED. TAKE ADEQUATE PRECAUTIONS TO SEE THAT NO PART OF THE HUMAN BODY IS EXPOSED TO X-RADIATION, DIRECT OR INDIRECT

- Produce X-rays and set the two rectangular shutter to maximum position.
- Widen the round field so that its projection is slightly smaller than the I.I. receptor surface.
- Observe the x-ray field edges: a hazy edge means that the primary cone, near the beam, is cutting the x-ray field instead of the iris shutters located at the collimator exit.
- This condition may be corrected by loosening the three hexagonal centring screws on the collimator attachment plane - see **Figure 1** in this chapter.
- Move the collimator so that the entire x-ray field edge is well defined.
- Tighten the three hexagonal screws.

NOTE: THE HEEL EFFECT WILL CAUSE THE FIELD TOWARD THE CATHODE TO BE SLIGHTLY LESS SHARP THAN ON THE OTHER THREE SIDES. THIS IS NORMAL AND CANNOT BE CORRECTED BY ADJUSTMENTS.

- Close the two pairs of lead rectangular shuttersone at a time until the projection is aligned with the edges projected by the round field. If alignment is noted on one shutter only (while the other shutter juts out or is hidden by the round field), close the rectangular field further so that the other shutter is correctly positioned. This determines the amplitude of the correction.
- Should a correction become necessary, loosen the three hexagonal centring screws on the iris support plate - see **Figure 2** in this chapter.
- Place the iris collimator in the desired position and tighten the three screws.
- Rotate the rectangular shutters 360°to check on uniformity of alignment over the round field. If alignment is not uniform, repeat points 2,3, and 4.

Figura 1 R605DASM

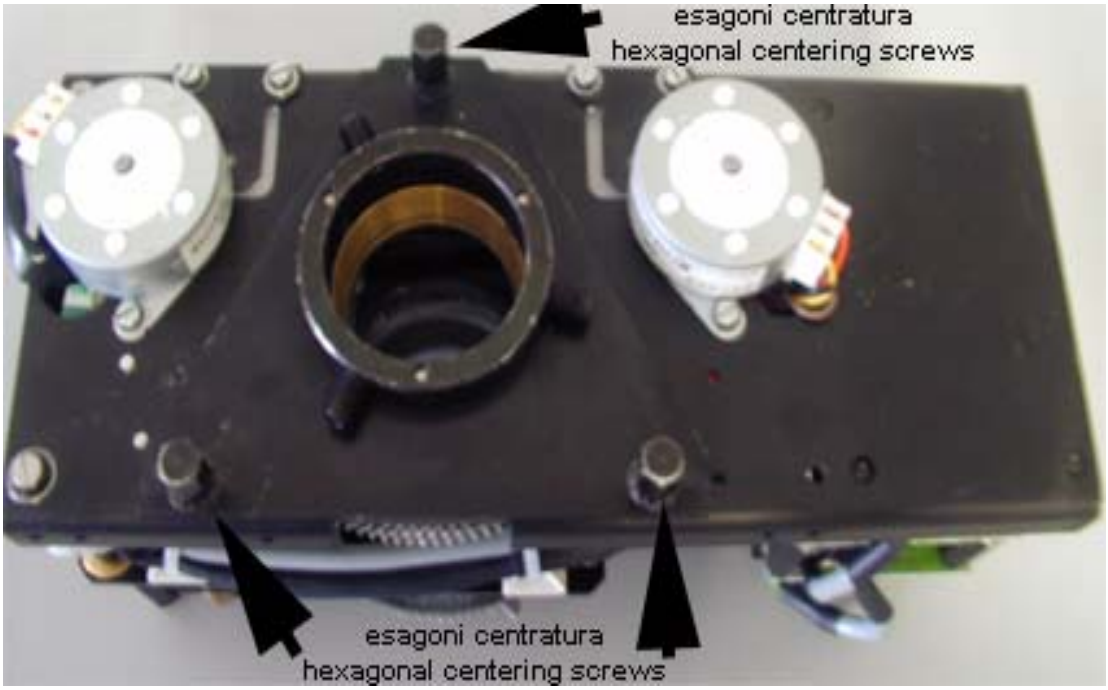

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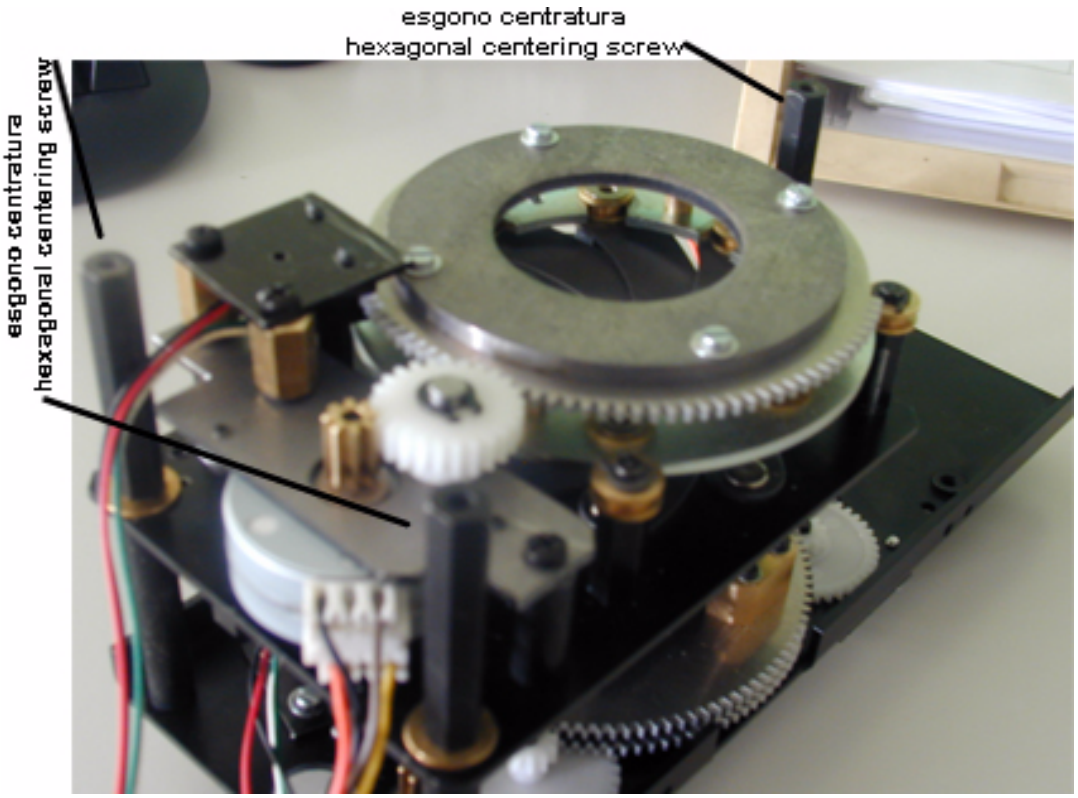
Figura 2



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M - ADJUSTMENTS

Adjustments are to be performed by technically qualified and authorized personnel only.

IRIS MOTOR ADJUSTMENT:

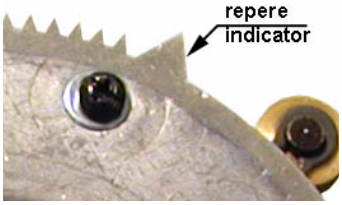
Motor gear - intermediate gear:

- Remove the two screws "**A**" and the haxagonal spacer **"B"** see **Figure 1** in this chapter.
- Turn the motor support plate to access the two motor fixing screws and loosen the two screws.
- Mount the hexagonal spacer **"B"** and the screw **"A" -** not tighten
- The plastic gears have a slightly oval shape. Find the critical point and adjust play on this point.
- Tighten the screws "**A**" and the hexagonal spacer **"B"**.

Intermediate gear- iris movement gear:

- Loosen the screws "**A**" and the hexagonal spacer **"B" -** see **Figure 1**in this chapter.
- Plastic gears are slight oval find the critical point and adjustment play accordingly.
- Tighten the screws "**A**" and the hexagonal **"B"**.

ADJUSTMENT OF IRIS PHOTOCELL



The serrated section of the gear ends with an indicator that serves to cut-off the photocell beam on completed iris closure.

- Loosen screws "**F**" to adjust the photocell - see **Figure 2** in this chapter.
- Move the photocell until a return signal of photocell cut-off is received.
- Tight the two screws "**F".**

ADJUSTMENT OF SHUTTER MOTORS

Shutter gear - intermediate gear:

- Loosen the two screws "**D**" - see **Figure 3** of this chapter.
- Plastic gears are slight oval find the critical point and adjustment play accordingly.
- Tighten the screws "**D**".

Motor gear:

- Loosen the two screws "**C**" - see **Figure 3** of this chapter.
- Plastic gears are slight oval find the critical point and adjustment play accordingly.
- Tighten the screws "**C".**

ADJUSTMENT OF SHUTTER PHOTOCELLS

- Close the shutters completely, the indicator will appear on the corner of parallelogram, rotate the parallelogram until the indicator cuts-off the photocell beam. See **Figure 2 and 4** of this chapter.
- Adjust the parallelogram until the bar, with the indicator on its end, is parallel to the bent border of the collimator base.
- If necessary loosen the two screws **"B"** and adjust the photocell until a return signal indicating cell shut-off is obtained, Led on the edge of the collimator.

Figura 1

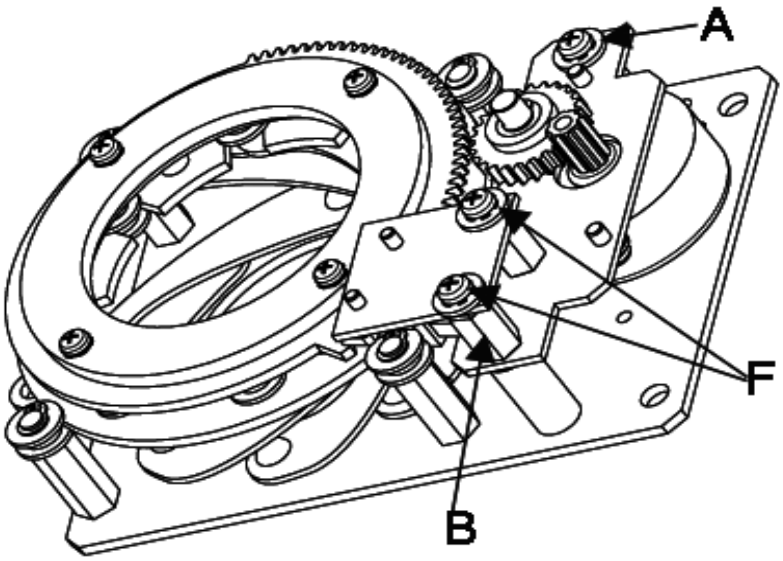


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Figura 2

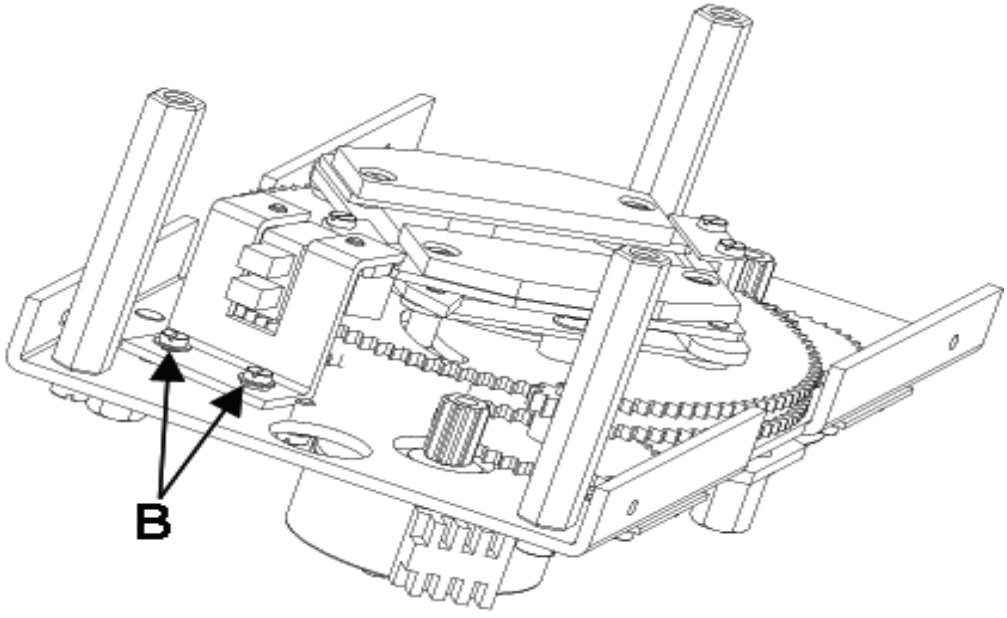

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Figura 3

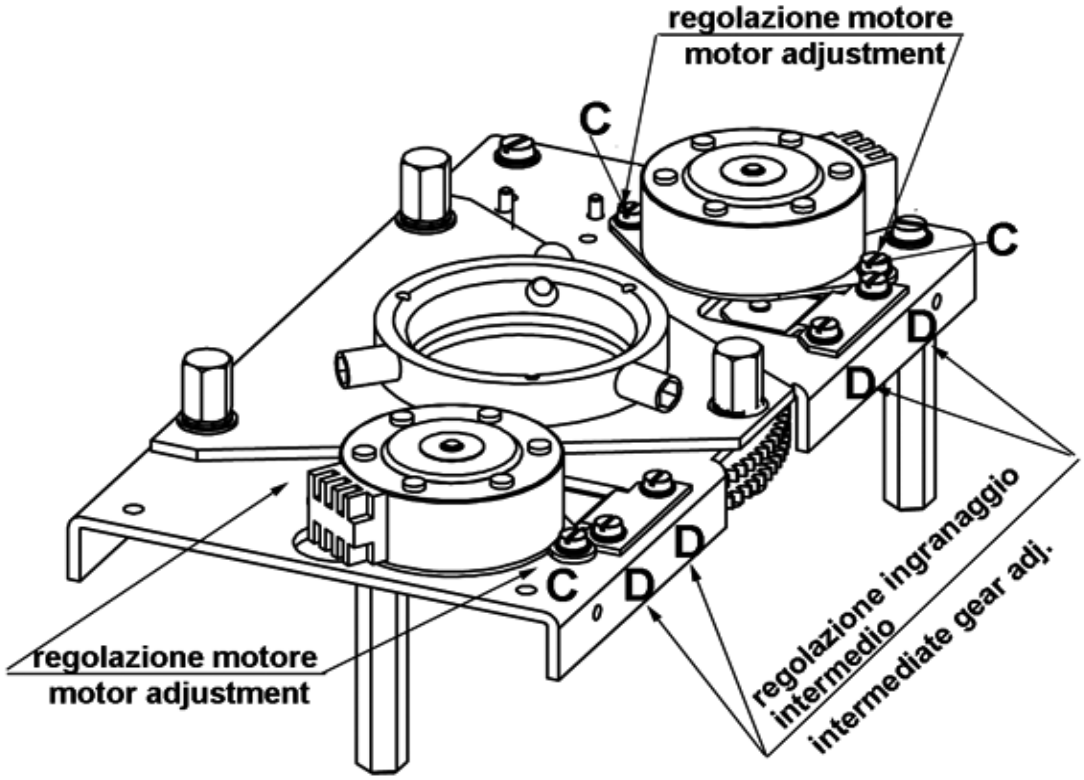

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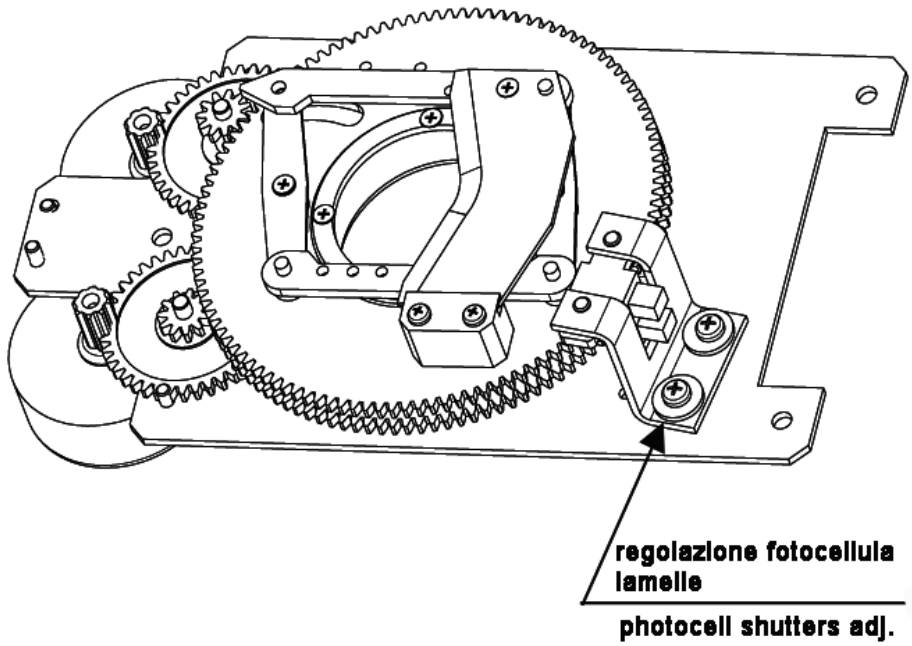
Figura 4



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N - OPERATION INSTRUCTIONS

System setting

- By supplying the system the collimator carries out Reset of all the axes. Once Reset is ended the system sets at format 1

- The collimator is ready to operate.

- It is possible to limit the projected format by appropriate inputs or by selecting a new format. By varying FFD the system keeps the chosen format steady.

O - SUBSTITUTIONS, DISASSEMBLY, TRANSPORT

THE FOLLOWING OPERATIONS MUST BE PERFORMED BY AUTHORISED PERSONNEL WITH TECHNICAL TRAINING.

SUBSTITUTION OF THE IRIS MOTOR

- Disconnect supply
- Remove the cover
- Unscrew the screw "**A**" and the hexagonal spacer "**B**"- see **Figure 1** - chapter **ADJUSTMENTS**
- Rotate the support plate and unscrew the two motor fixing screws.
- Disconnect the board cable from connector J5V1.
- Substitute the motor with an identical item.
- Fasten the screw "**A**" and the hexagonal spacer "**B**" - not tighten.
- Re-mount the motor support plate.
- Adjust play between motor- and intermediate-gear - see **ADJUSTMENTS**
- Tighten the screw "**A**" and the hexagonal spacer "**B**"
- Connect the motor cable to the board.
- Re-mount the cover.

SUBSTITUTION OF THE IRIS PHOTOCELL

- Disconnect supply.
- Remove the cover
- Unscrew the two screws "**F**" - see **Figure 1** - chapter **ADJUSTMENTS.**
- Disconnect cables from the board.
- Remove the photocell support
- Substitute the photocell with an identical item.
- Connect the photocell cables to the board on connector J3V1 as follows:
  Pin 1 not connected
  Pin 2 not connected
  Pin 3 black
  Pin 4 red
  Pin 5 white
  Pin 6 green
- Remove the photocell support through the two screws "F"
- Adjust the photocell position - see **ADJUSTMENTS**
- Re-mount the cover.

SUBSTITUTION OF SHUTTER MOTORS

- Disconnect supply.
- Remove the cover.
- Unscrew the two screws "**C**" - see **Figure 3** - chapter **ADJUSTMENTS.**
- Disconnect cables from the board: J5V2 rotation - J5V3 travel
- Fasten the two screws "**C**" not tighten.
- Substitute the motor with an identical item.

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- Adjust play between motor- and intermediate-gear - see **ADJUSTMENTS**
- Tighten the two screws "**C**" - see **Figure 3** - chapter **ADJUSTMENTS**
- Connect the motor cable to the board.
- Re-mount the cover.

SUBSTITUTION OF PHOTOCELL SHUTTERS.

- Remove the cover
- Unscrew the screws "**B**" and "**E**"- see **Fiuger 2 and 4** - chapter **ADJUSTMENTS**
- Disconnect cables from the board
- Substitute the photocell with an identical item.
- Connect the photocell cables to the board on connector J3V1 as follows:
  Pin 1 not connected
  Pin 2 not connected
  Pin 3 black
  Pin 4 red
  Pin 5 white
  Pin 6 green
- Mount the photocell supports
- Adjust photocell position - see **Figure 3** - chapter **ADJUSTMENTS**
- Re-mount the cover

Disassembly

- Disconnect supply to the collimator.
- Remove the rear cover and disconnect the supply cables.
- Loosen the 4 fixing Allen screws on the upper part of the collimator - ***care must be taken not to let the collimator fall.***

Transport and storage

- Suitable packing must be provided for the collimator.
- Place the collimator in a plastic bag to avoid packing material from entering the collimator.
- Use an appropriate box for transport, shipment or storage taking care to protect the collimator from rough handling. This will avoid damage to the collimator during transport shipment or storage.
- Limit Storage conditions:
- Ambient Temperature = from -40°C to +70°C
- Relative Humidity = from 10% to 95%
- Atm. Pressure = from 500 a 1060 hPa

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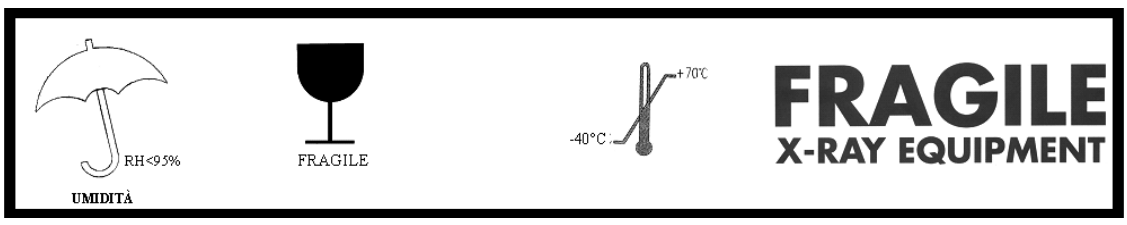

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P - ROUTINE MAINTENANCE

To ensure constantly safe performance of the collimator and its compliance with applicable regulations, a maintenance program is indispensable.

It is the Owner's responsibility to supply or arrange for this service

Cleaning recommendations

If the collimator is not protected by an overall cover, the covering must be cleaned as prescribed by the sanitary regulations followed by the operator.

- Disconnect supply
- Use non abrasive cleaning products.
  Care must be taken to prevent liquid from entering the collimator. **N.B. the collimator cover is not watertight.**

Do not re-apply power if inflammable liquids have leaked into the collimator.
See the following Maintenance Instructions.

Recommended maintenance programme:

Ralco suggests a yearly servicing programme. However shorter intervals are advisable when the collimator is subject to heavy workloads.

- Re-calibration of the collimator will be necessary whenever the x-ray tube is changed.
  Calibration procedures must be performed as described in this manual.
- Check that the screws which serve to secure the collimator to the flange/tube adapter are correctly tightened.
- Remove the covers and panels from collimator. Inspect the moving parts for signs of wear or damage.
- Check the electric system and substitute parts that show wear.
- Check the Lexan panel and substitute if necessary.
- Clean the collimator with a soft cloth paying particular attention to the Lexan window. **Do not** use abrasive or inflammable cleaning products.
- Sparingly lubricate the moving parts using graphite oil.
- Wipe away all excess oil and remount the cover.

IMPORTANT: MAKE SURE TO TIGHTEN THE M6 ALLEN SCREWS SECURING THE CONTROL TABS.
APPROPRIATE TIGHTENING OF THE ALLEN SCREWS ENSURES SECURE MOUNTING OF THE COLLIMATOR. TIGHTENING FORCE USED MUST NOT EXCEED 0.50 NM.

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Q - TROUBLESHOOTING

Should the Collimator become faulty do use it until it is completely repaired.

The use of a faulty collimator might impair the safety of the operator and patient.

Before returning the collimator to Ralco for repair, please make sure that it isn't one of the following problems to cause the fault.

problem	cause	solution
The Shutters fail to move	The collimator is not controlled correctly	Check the board controlling the motor - See the instructions provided by the board manufacturer.
	The motor is faulty.	Substitute the motor - See Chapter **SUBSTITUTIONS** in this manual.
The shutters fail to position correctly	Faulty electronic control of the collimator	Check the board controlling the motor - See the instructions provided by the board manufacturer.
	Photocells are not positioned correctly for reset operations..	Check photocell positioning - See Chapter **CALIBRATIONS** in this manual.

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R - PARTI DI RICAMBIO / SPARE PARTS

NOTA: nell'ordinare le parti di ricambio, il cliente deve specificare il modello ed il numero di serie del collimatore.	**NOTE: when ordering spare parts, the customer is requested to specify the collimator model and serial number.**

R 605 DASM

Cod.	Descrizione	Description
RS 476	Motore passo-passo iride e lamelle	stepper motor for iris and shutters
RS 786	Cono ottone	Brass cone
RS 665	Fotocellula	photocell
RS 477	Flangia del montaggio, collimatore tubo	Mounting flange, collimator tube connection
RS 835	Attacco tubo	Connection tube
RS 836	Copertura	Housing
RS 837	Scheda elettronica CAN DC STEP Iride	Can DC Step board, Iris
RS 838	Scheda elettronica CAN DC STEP, movimento lamella	Can DC Step board, shutter movement
RS 839	Scheda elettronica CAN DC STEP, rotazione lamella	Can DC Step board, shutter rotation
RS 840	Scheda elettronica CAN DC STEP, movimento filtro	Can DC Step board, filter movement
RS 841	Scheda elettronica CAN DC STEP, rotazione filtro	Can DC Step board, filter rotation
RS 847	ASR003 PCB scheda esterna	ASR003 PCB outside collimator

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R 605/025/DASM

Cod.	Descrizione	Description
RS 476	Motore passo-passo iride e lamelle	stepper motor for iris and shutters
RS 786	Cono ottone	Brass cone
RS 665	Fotocellula	photocell
RS 477	Flangia del montaggio, collimatore tubo	Mounting flange, collimator tube connection
RS 835	Attacco tubo	Connection tube
RS 836	Copertura	Housing
RS 848	Scheda elettronica CAN DC STEP Iride	Can DC Step board, Iris
RS 849	Scheda elettronica CAN DC STEP, movimento lamella	Can DC Step board, shutter movement
RS 850	Scheda elettronica CAN DC STEP, rotazione lamella	Can DC Step board, shutter rotation

R 605/027/DASM

Cod.	Descrizione	Description
RS 476	Motore passo-passo iride e lamelle	stepper motor for iris and shutters
RS 786	Cono ottone	Brass cone
RS 665	Fotocellula	photocell
RS 845	Flangia del montaggio, collimatore tubo	Mounting flange, collimator tube connection
RS 835	Attacco tubo	Connection tube
RS 846	Copertura	Housing
RS 842	Scheda elettronica CAN DC STEP Iride	Can DC Step board, Iris
RS 843	Scheda elettronica CAN DC STEP, movimento lamella	Can DC Step board, shutter movement
RS 844	Scheda elettronica CAN DC STEP, rotazione lamella	Can DC Step board, shutter rotation

Etichetta/Label

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Esploso/Parts Breakdown:

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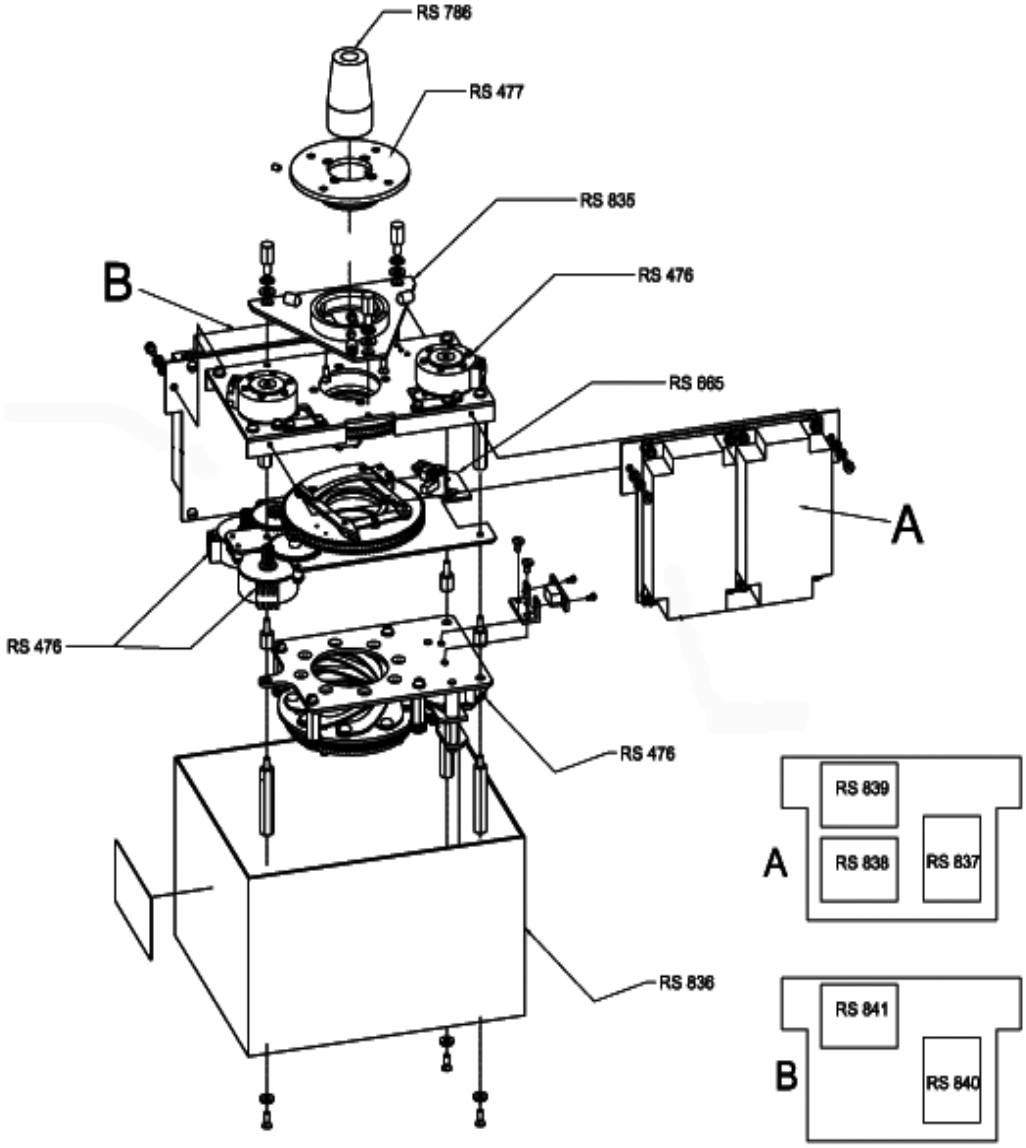

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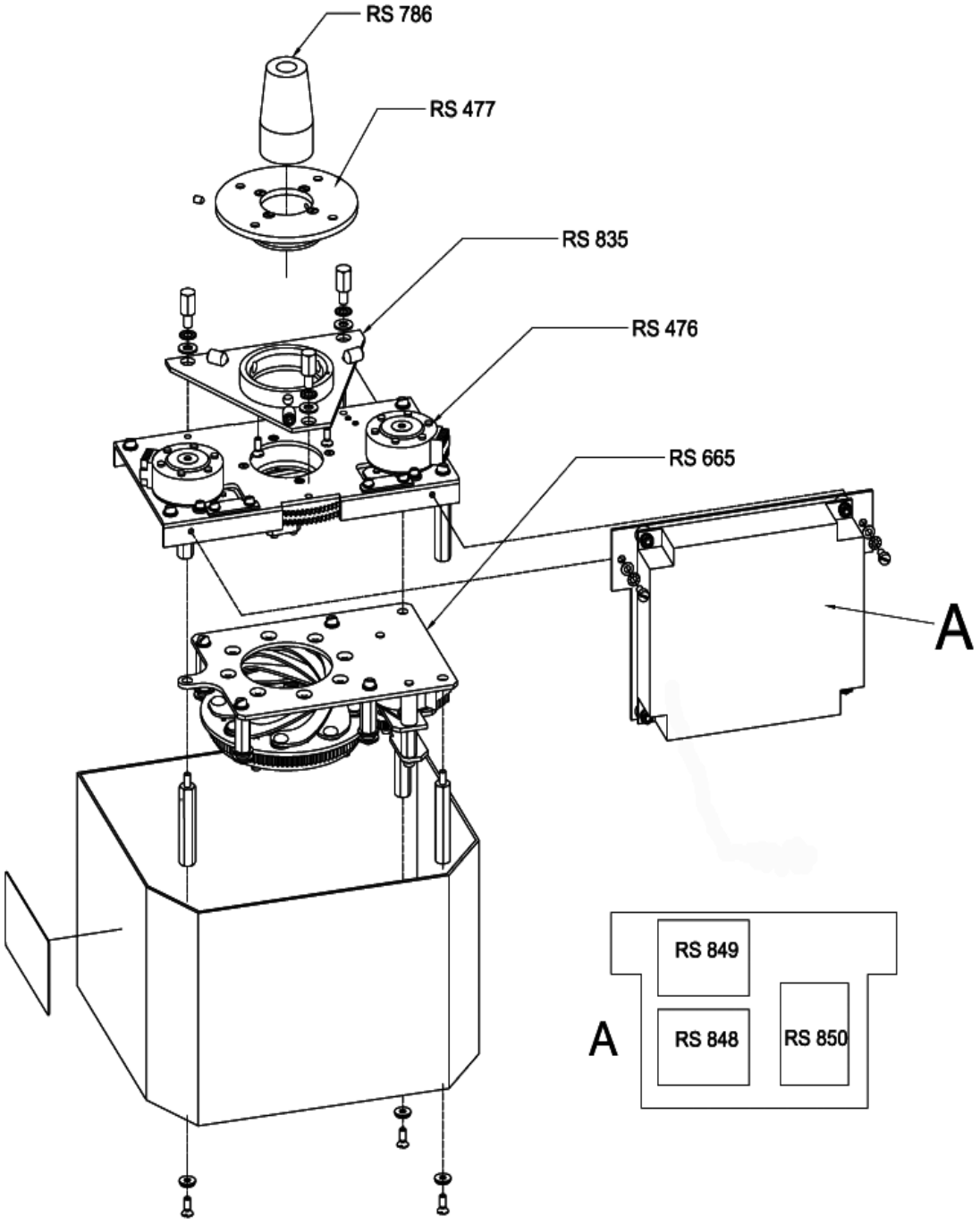

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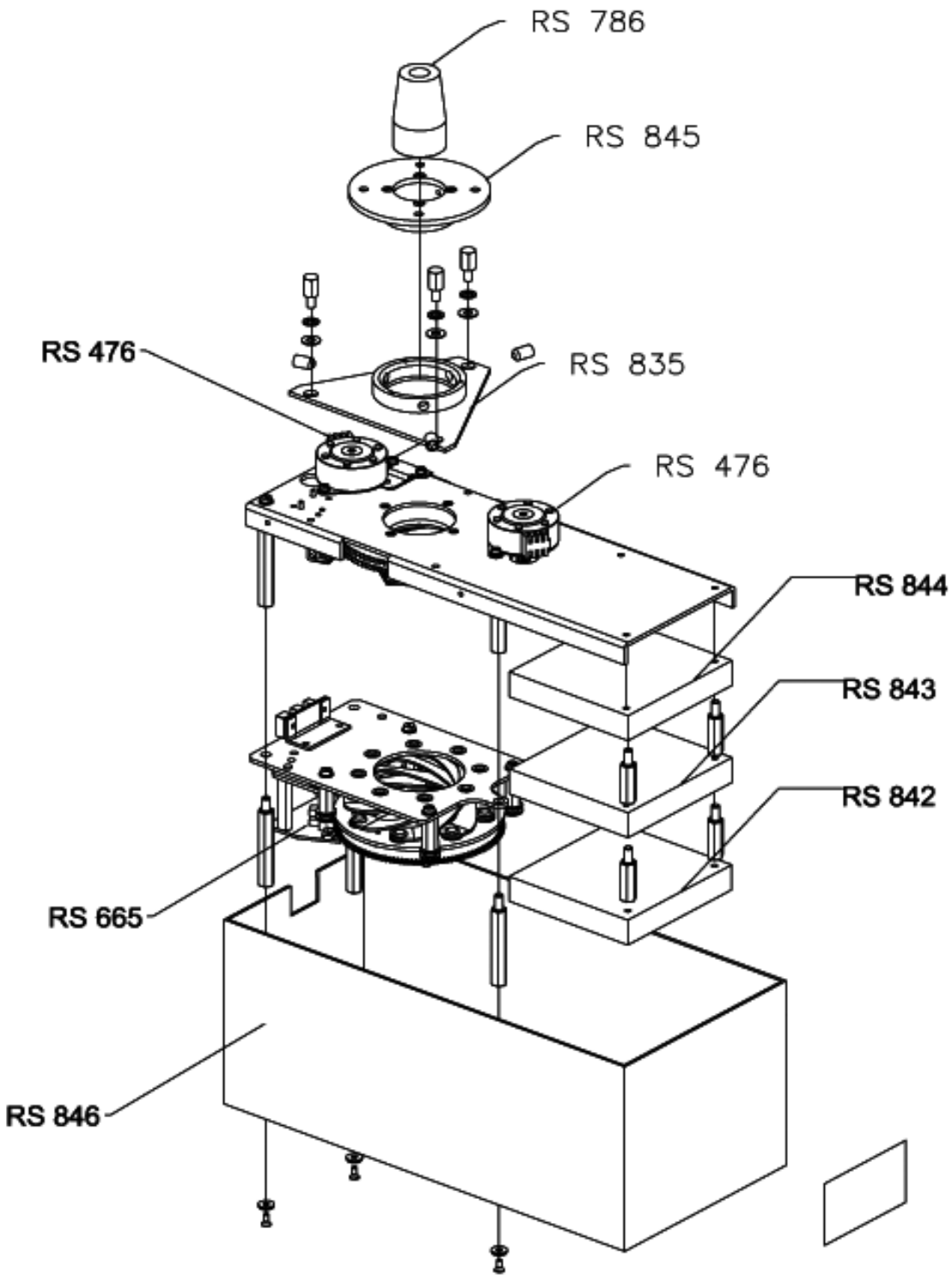

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S - GENERAL

REPAIRS

- Return the collimator to Ralco at the customer's expense if the unit is out of warranty.
- Provide the collimator with a detailed description (in Italian or English) of the functional problems and/or faults. It is important to indicate whether a repair or a complete overhaul is required.
- Our Quality Control will test the collimator.
- If the repair involved is extensive, Ralco will contact the customer to advise on the repair or possible substitution.

END OF LIFE DISPOSAL

Your collimator contains materials which can be recycled and reused. Specialised companies can recycle your product to increase the amount of reusable materials and to minimise the amount of materials to be disposed of.

The collimator does not contain polluting materials or products with the exception of the lead that composes the shutters - avoid direct contact with lead especially for prolonged periods.

It is recommended that you observe Local Laws regulating the disposal of your old set. Should this prove impossible, return the collimator to Ralco at the purchaser's expense and Ralco will take care of its correct disposal.

The product requires correct disposal at the end of its life-cycle and according to the current standards; it cannot be considered as normal waste. The unit must be disposed of through certified environmental management concerns or, should you need to replace the unit with new equipment, returned to Ralco. Please contact us if you require further information.

The product contains lead which can be highly contaminating if dispersed incorrectly. The following symbol signified that the products conforms to the environmental requirements of directives 202/95/EC, 2002/96/EC, 2003/108/EC; it must be disposed of correctly at the end of its life-cycle.

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WARRANTY

Ralco undertakes to replace and repair any collimator part during a period of 24 months from the date of invoice and cover the labour costs involved.

The warranty applies provided the product has been handled properly in accordance with its operating instructions; presentation is required of the original invoice indicating the date of purchase, the model and serial number as well as other documents originally supplied with the set.

The warranty does not apply if:

- The documents have been altered in any way or made illegible;
- The model or production number on the product has been altered, deleted, removed or made illegible;

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- Repairs or product modifications and alterations have been performed by unauthorised persons;
- Damage is caused by misuse or neglect, incorrect installation or accidental damage including but not limited to lighting, water or fire.
- Use of unoriginal spare parts and accessories.

In-warranty spares will be available only upon return to Ralco, at the customer's expense, of the parts considered to be faulty to allow assess the cause of the fault.

Components not covered by this warranty:

Consumable items such as lamps.

Items not produced by Ralco; these items will be accorded to warranty granted by the constructor:

- Motors - 1 year
- Potentiometres: 1 year
- Electronic boards: 1 year
- Laser 12 months

Ralco reserves the right to decide if the collimator is to be repaired or substituted.

Defective material is to be sent to:

RALCO SRL
VIA DEI TIGLI 13/G
20046 BIASSONO (MI) - ITALIA
FAX: ++39-039-2497.799
EMAIL: RALCO@RALCO.IT

SAFETY/RESPONSIBILITY

Ralco adheres to the directives governing manufacturers of electro-medical equipment:

Directive 93/42 CEE para.10 -Legislative Decree n° 46 para.10

Ralco shall not be held responsible when instructions provided in the present manual are not complied with.

Ralco shall not be held responsible if the collimator relates to one or several of the following instances:

- The unit is of Ralco construction to client specifications (no CE marking)
- The unit has been modified by the OEM or end user.
- The unit has been installed without respecting the instructions provided in this manual.
- The unit is used without respecting the instructions provided in this manual.
- The unit has not been subject to routine functional inspection.
- The unit has not been subject to routine maintenance.
- The unit has been repaired with unoriginal spare parts.
- Ralco shall decline all responsibility for any damage, direct or indirect, caused to persons or things by inappropriate accessories.

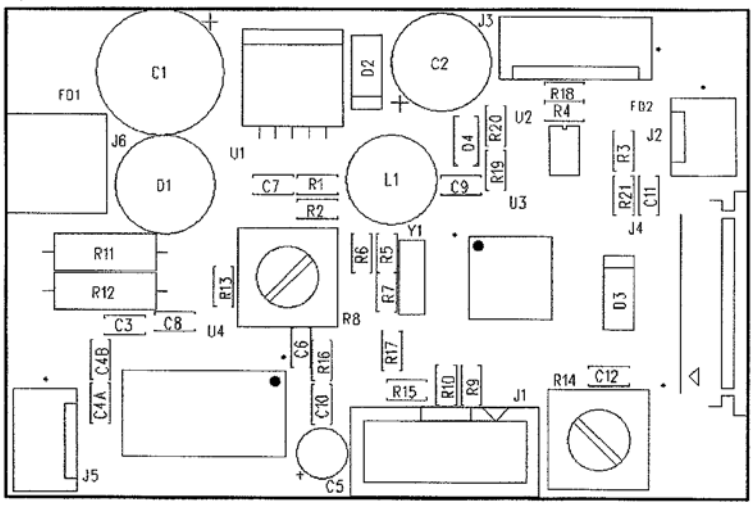
INFORMATION REGARDING ACCIDENTS THAT HAVE OCCURED WHILE USING THE RADIOLOGICAL COLLIMATOR MUST BE REPORTED IMMEDIATELY TO RALCO SRL.

T - FIGURE E SCHEMI / FIGURES AND DIAGRAMS

NOTA: NEL CASO LO SCHEMA ELETTRICO DA VOI RICHIESTO FOSSE DIVERSO DA QUELLO STANDARD - SI PREGA CONSULTARE GLI ALLEGATI	**NOTE: SHOULD THE ELECTRIC DIAGRAM REQUESTED BY YOU DIFFER FROM THE STANDARD UNIT SUPPLIED - PLEASE SEE THE ATTACHMENTS**

ATTENZIONE L'ALIMENTAZIONE SUL COLLIMATORE NON È PROTETTO DA FUSIBILE. PRIMA DI COLLEGARE, CONTROLLARE CHE L'ALIMENTAZIONE SIA PROTETTA DA FUSIBILE ESTERNO. FUSIBILE: 3,15 AMP	WARNING COLLIMATOR SUPPLY IS NOT PROTECTED BY A FUSE. PRIOR TO CONNECTING THE UNIT CHECK THAT SUPPLY IS PROTECTED BY AN EXTERNAL FUSE. FUSE: 3,15 AMP

Figura 1



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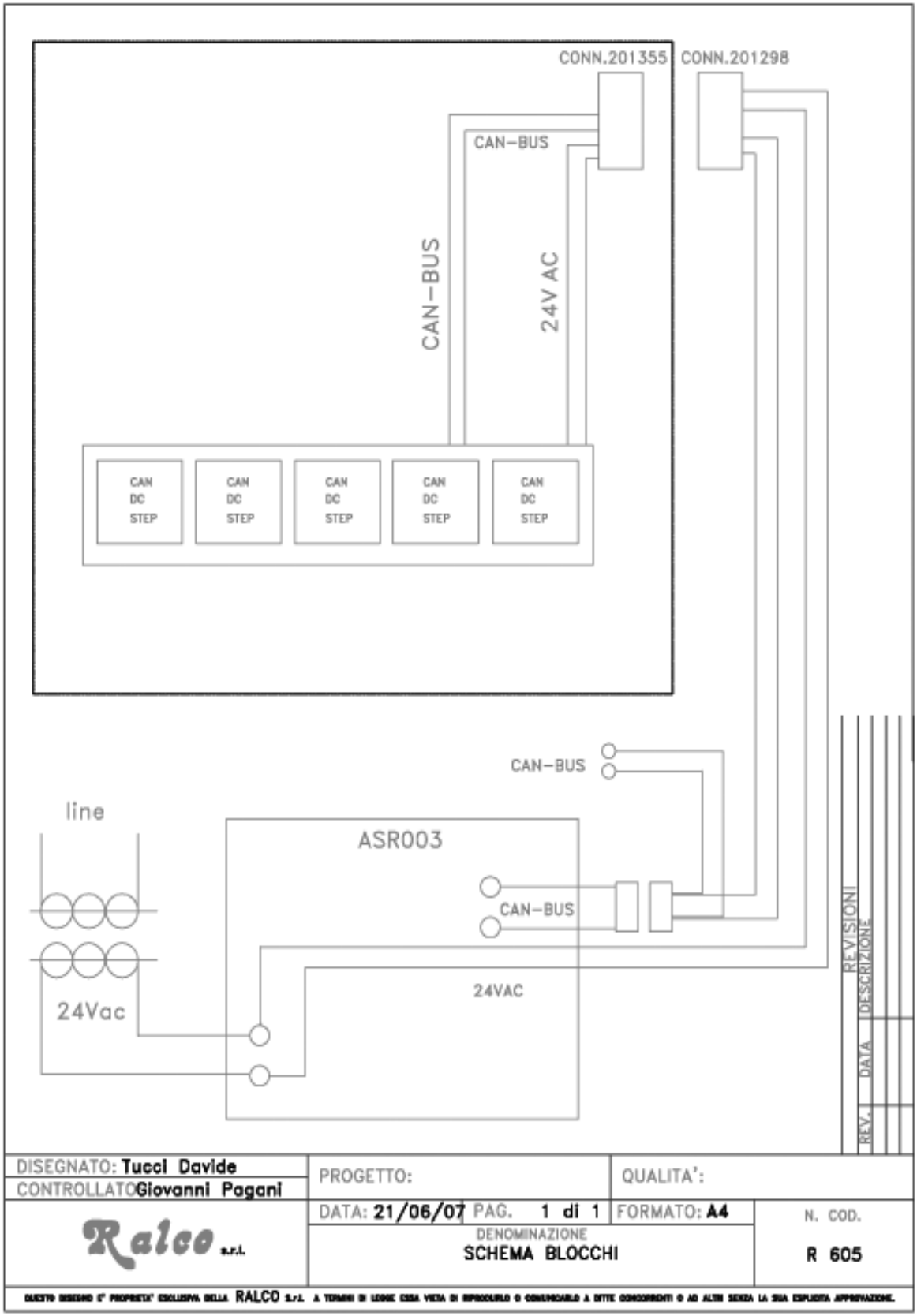
figure_schemi_DASM.fm

Figura 2



figure_schemi_DASM.fm

Figura 3

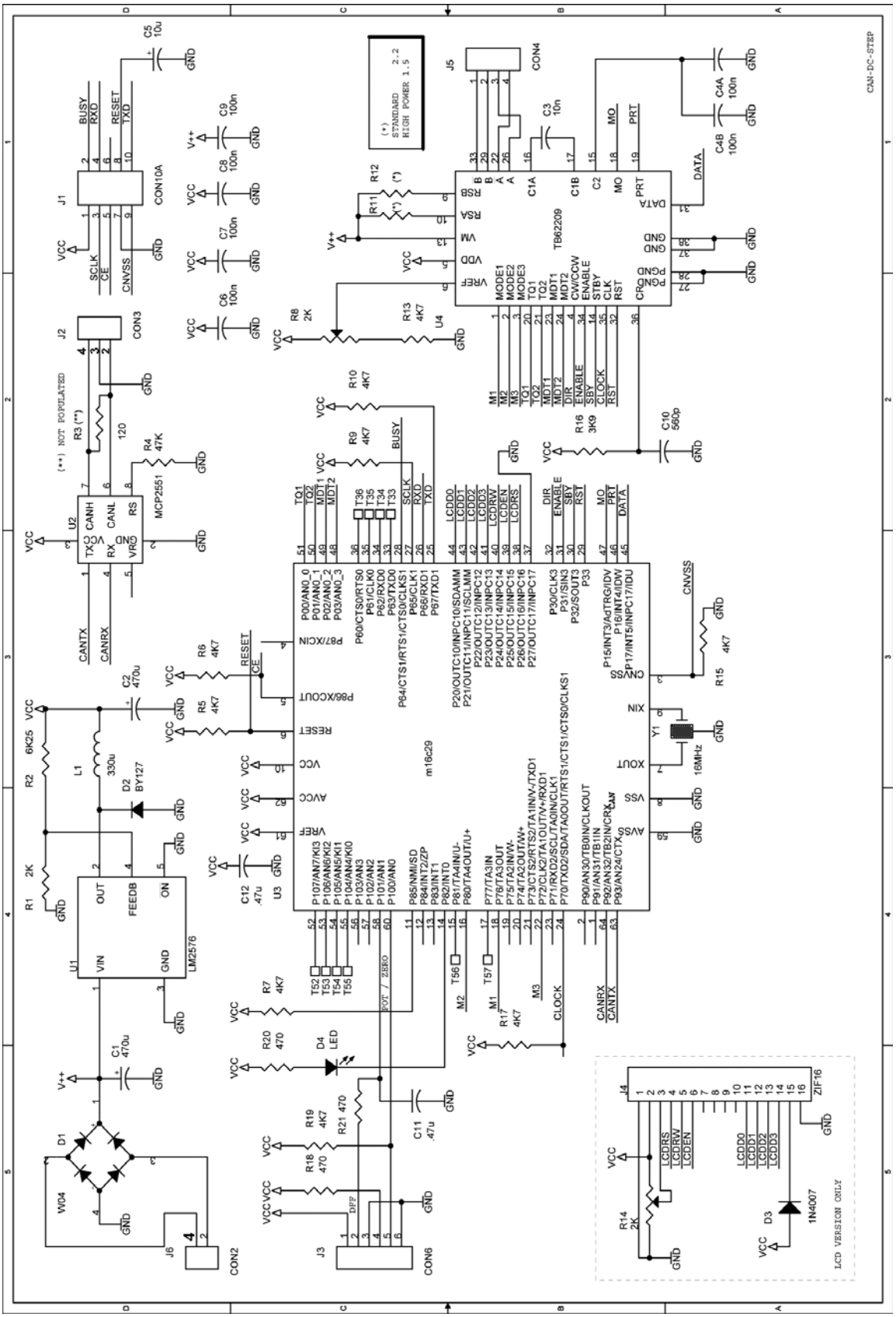


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Figura 4 - Cablaggio/Wiring DASM

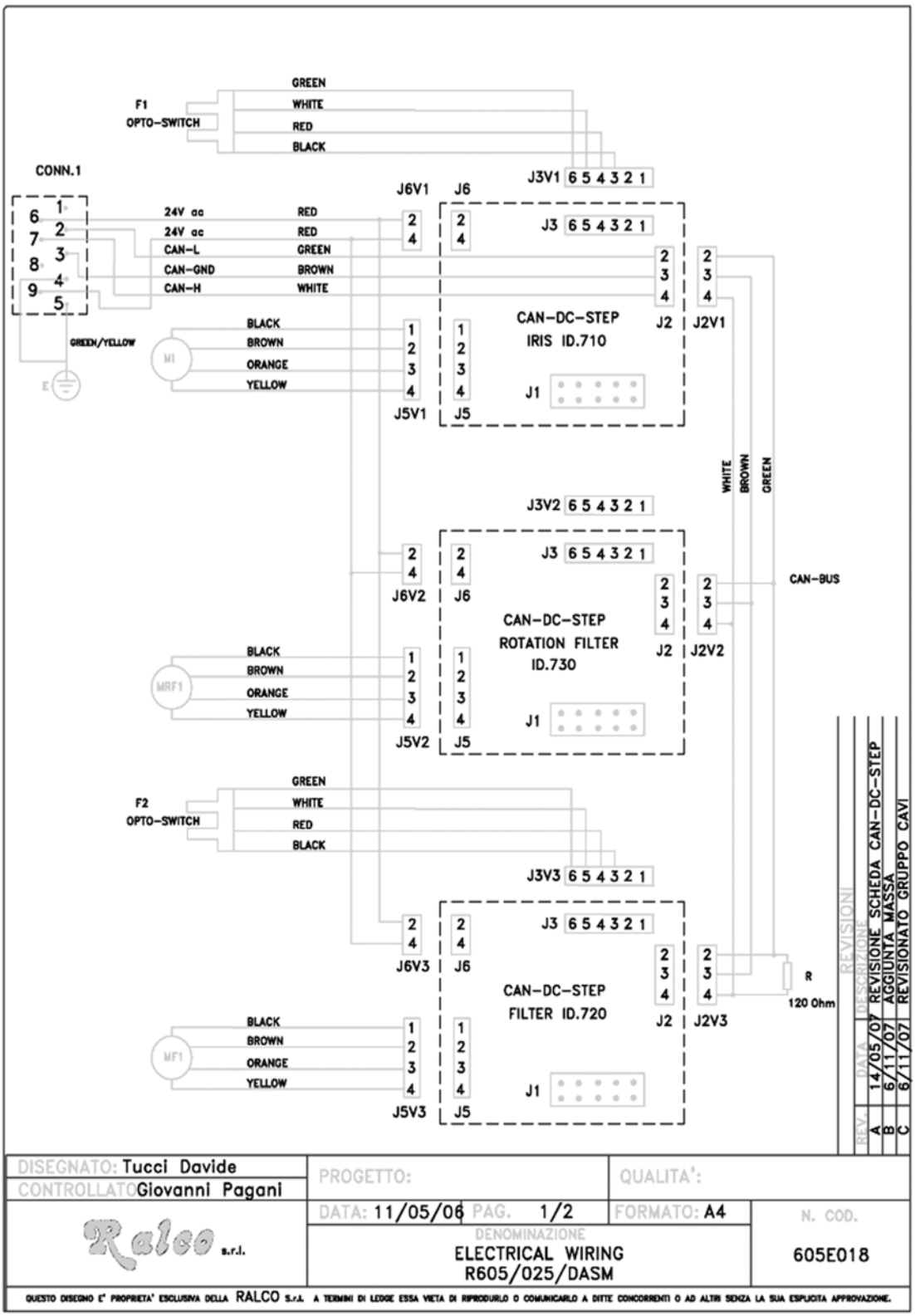

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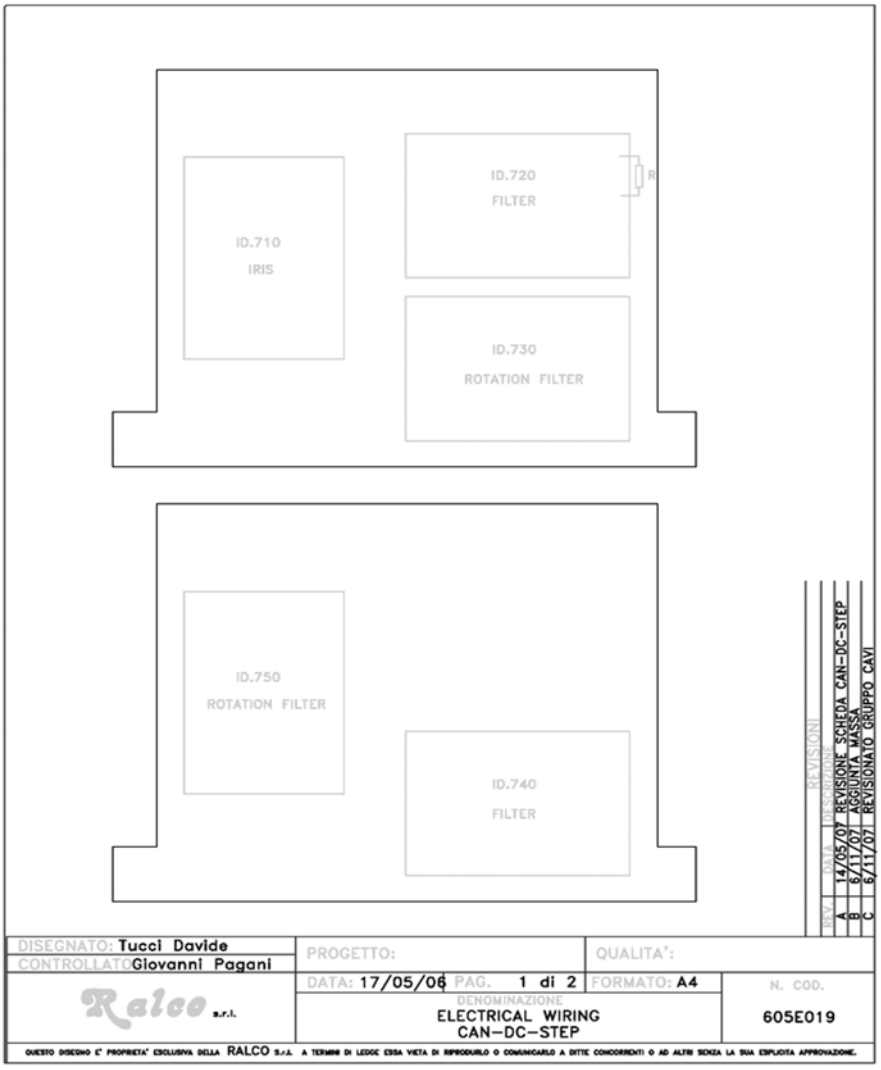
Figura 5



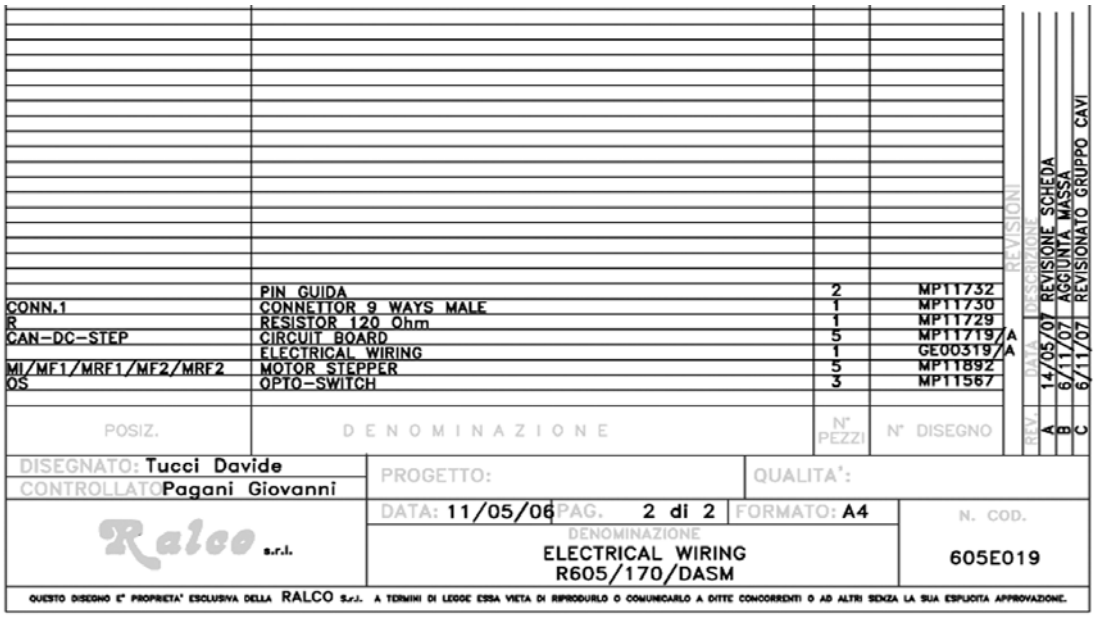

PIN GUIDA 2 MP11732
CONN.1 CONNETTOR 9 WAYS MALE 1 MP11730
R RESISTOR 120 Ohm 1 MP11729
CAN-DC-STEP CIRCUIT BOARD 5 MP11719/A
ELECTRICAL WIRING 1 GE00319/A
MI/MF1/MRF1/MF2/MRF2 MOTOR STEPPER 5 MP11892
OS OPTO-SWITCH 3 MP11567
POSIZ. DENOMINAZIONE N° PEZZI N° DISEGNO
REVISIONI
REV. DATA DESCRIZIONE
A 14/05/07 REVISIONE SCHEDA
B 6/11/07 AGGIUNTA MASSA
C 6/11/07 REVISIONATO GRUPPO CAVI
DISEGNATO: Tucci Davide
CONTROLLATO Pagani Giovanni
PROGETTO:
QUALITA':
DATA: 11/05/06 PAG. 2 di 2 FORMATO: A4
N. COD.
DENOMINAZIONE
ELECTRICAL WIRING
R605/170/DASM
605E019
QUESTO DISEGNO E' PROPRIETA' ESCLUSIVA DELLA RALCO S.r.l. A TERMINI DI LEGGE ESSA VIETA DI RIPRODURLO O COMUNICARLO A DITTE CONCORRENTI O AD ALTRI SENZA LA SUA ESPLICITA APPROVAZIONE.

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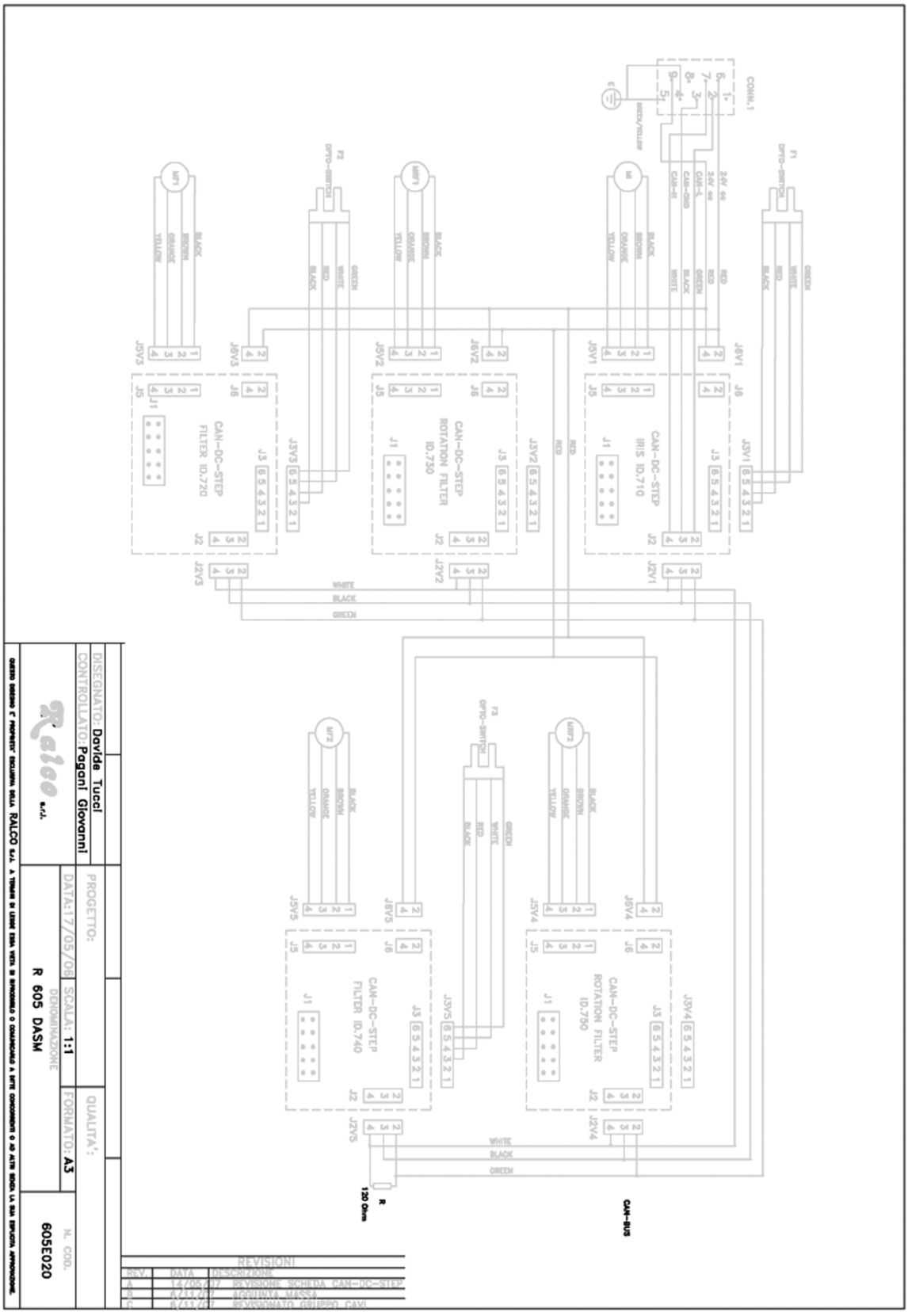
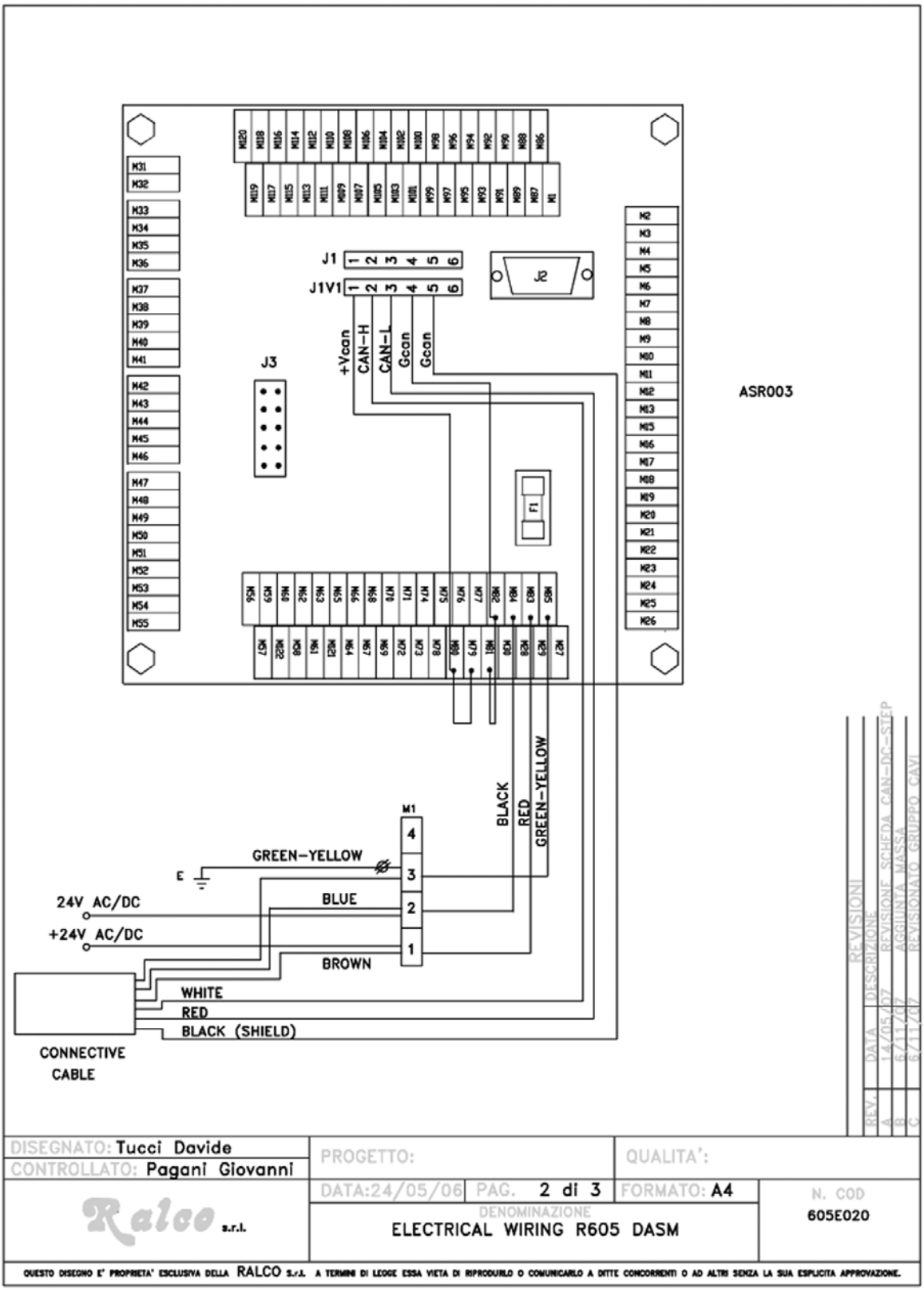
Figura 6



collimatori\elettrico\605DASM.gif

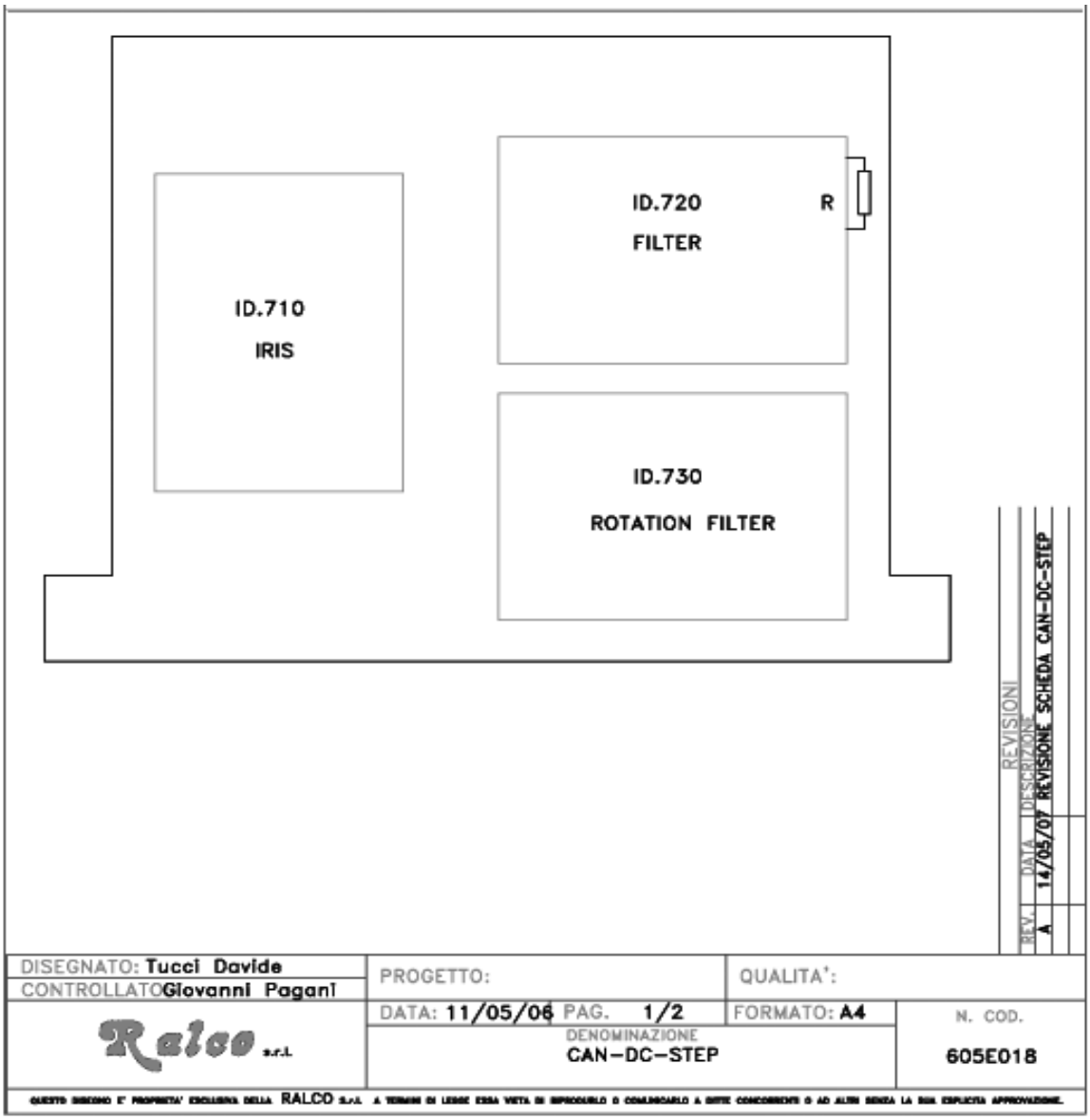
figure_schemi_DASM.fm

Figura 7



figure_schemi_DASM.fm

Figura 8



POSIZ.	DENOMINAZIONE	N° PEZZI	N° DISEGNO
	AMP MICRO CONTACT FEMALE	20	MP11401
	PIN GUIDA	2	MP11732
CONN.1	CONNECTOR 9 WAYS MALE	1	MP11730
R	RESISTOR 120 Ohm	1	MP11729
CAN-DC-STEP	CIRCUIT BOARD	3	MP11719/A
	ELECTRICAL WIRING	1	GE00319
MI/MF1/MRF1	MOTOR STEPPER	3	MP11892
OS	OPTO-SWITCH	2	MP11567

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Figura 9

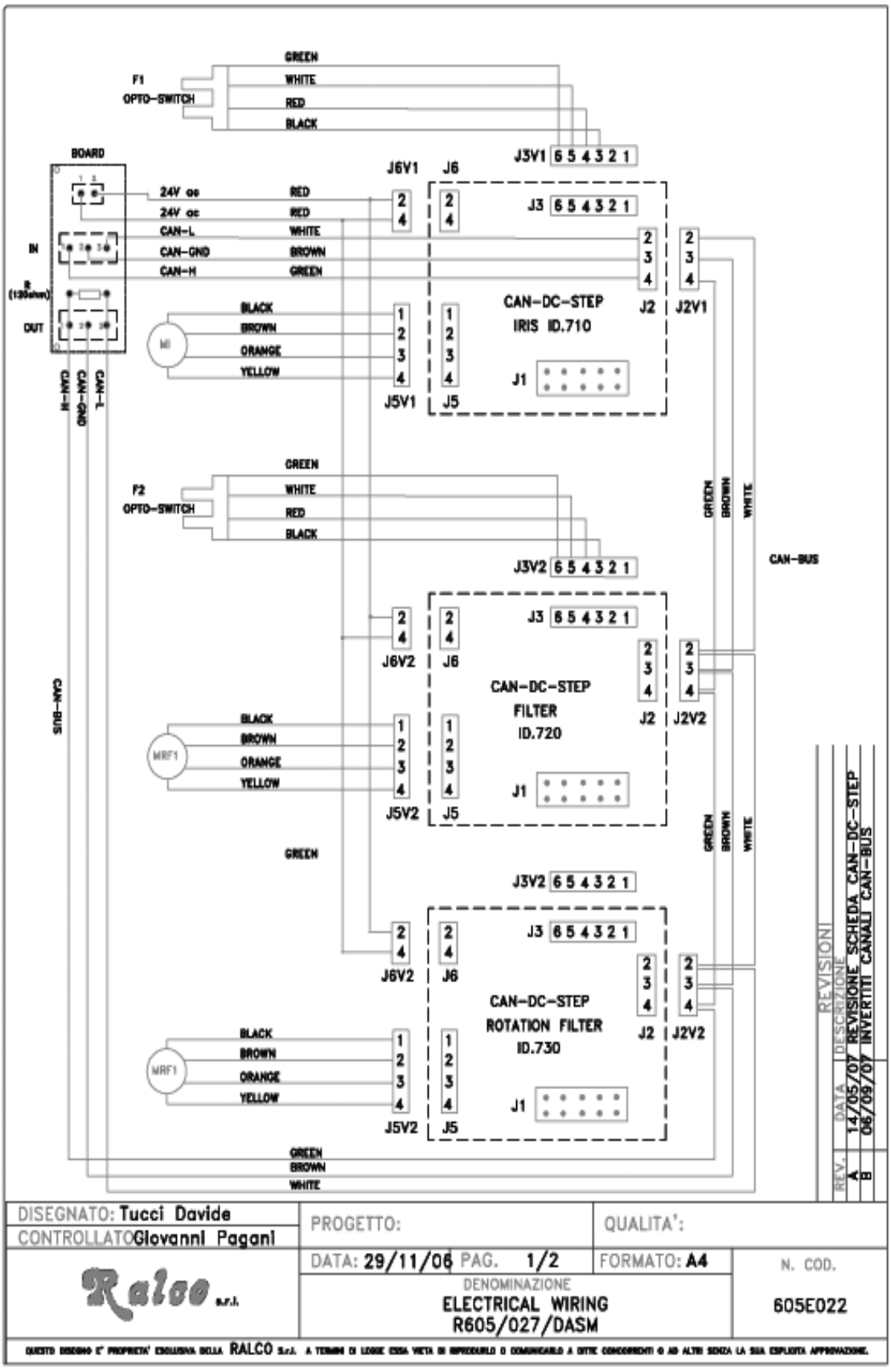

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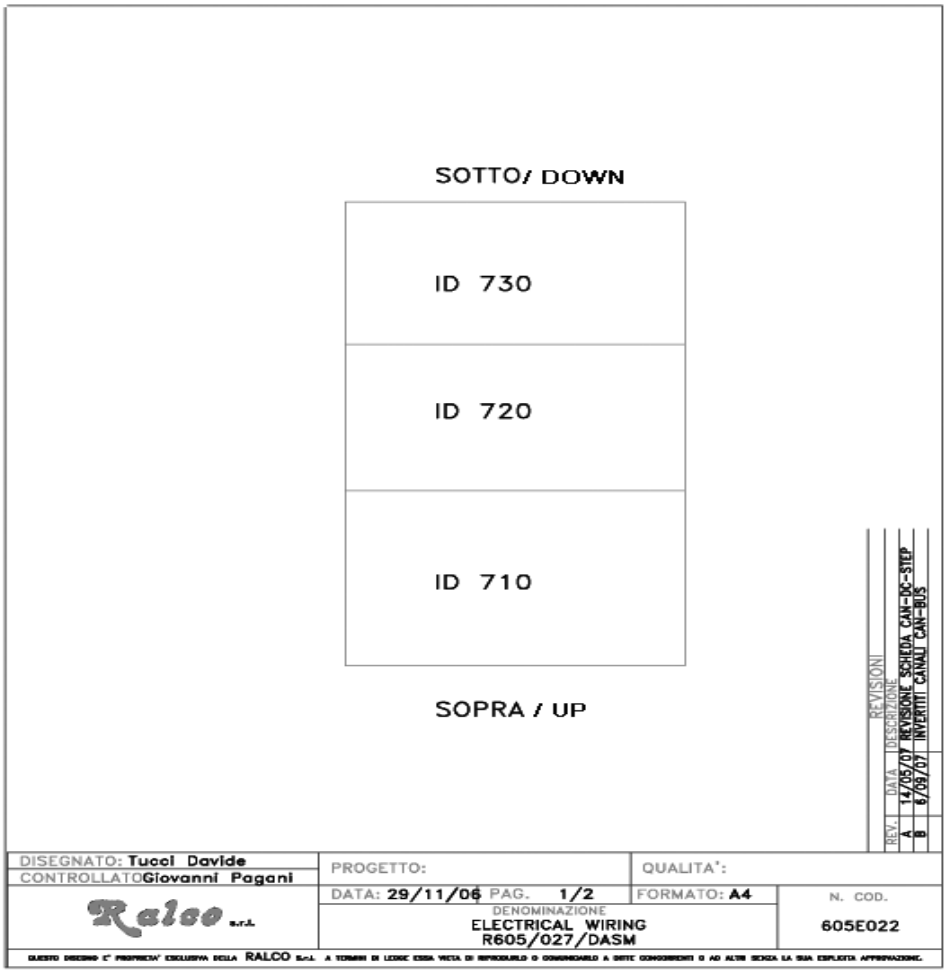
Figura 10



POSIZ.	DENOMINAZIONE	N° PEZZI	N° DISEGNO
BOARD	BASE BOARD	1	MP11570
	NYLON DISTANCER	12	MP10355
	AMP MICRO CONTACT FEMALE	39	MP11401
	CONNECTOR PHONIX 2 WAYS	1	MP11568
	CONNECTOR PHONIX 3WAYS	2	MP11569
R	RESISTOR 120 Ohm	1	MP11729
CAN-DC-STEP	CIRCUIT BOARD	3	MP11719/A
	ELECTRICAL WIRING	1	GE00319
MI/MF1/MRF1	MOTOR STEPPER	3	MP11892
OS	OPTO-SWITCH	2	MP11567

REVISIONI
REV. DATA DESCRIZIONE
A 14/05/07 REVISIONE SCHEDA CAN-DC-STEP
B 6/09/07 INVERTITI CANALI CAN-BUS

DISEGNATO: Tucci Davide
CONTROLLATO Pagani Giovanni
PROGETTO:
QUALITA':
DATA: 29/11/06 PAG. 2 di 2
FORMATO: A4
N. COD.
DENOMINAZIONE
ELECTRICAL WIRING
R605/027/DASM
605E022
RALCO S.r.l.

Figura 11

figure_schemi_DASM.fm

INFORMAZIONI PER IL COSTRUTTORE:	**INFORMATION FOR THE MANUFACTURER**
Nell'intento di garantire e migliorare la qualità del nostro prodotto, includiamo il presente modulo per consentirvi di segnalare eventuali non conformità o disagi riscontrati nell'installazione e nel successivo utilizzo del nostro collimatore. Vi preghiamo di spedire a carico della **RALCO srl, Via Dei Tigli 13/G, 20046 Biassono (mi) - Italia**	The following form is provided for your comments and suggestings with regards to the collimator so that we may ensure and improve the quality of our production. Should you have any comments and/or suggestions, please mail the form, post-free, to **RALCO srl, vla Dei Tigli 13/G, 20046 Biassono (mi) - Italia**
DATA/DATE:	
CLIENTE/CUSTOMER	

INFORMAZIONI RIGUARDANTI EVENTUALI INCIDENTI VERIFICATISI CON L'UTILIZZO DEL COLLIMATORE RADIOLOGICO:	**INFORMATION REGARDING POSSIBLE ACCIDENTS THAT MAY HAVE OCCURRED WHILE USING THE COLLIMATOR.**
La direttiva 93/42/cee prevede che incidenti (quali la morte o grave peggioramento dello stato di salute di un paziente) che vedano coinvolto il collimatore radiologico qui descritto, vengano segnalati al Ministero della Sanità e al Costruttore. Il presente modulo serve per segnalare alla ralco srl tali eventualità con spedizione del modulo a carico del destinatario.	Directive 93/42/cee states that accidents (such as death or grevious injury to a patient) that involve the collimator described herein, must be reported to the mInistry Of Health and to the Manufacturer. The present form is provided to report to Ralco srl post-free, accidents of the type stated in the directive.
DATA/DATE	
CLIENTE/CUSTOMER:	

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